

## ENVIRONMENTAL SCIENCE

S. No	Questions	BLOOMS TAXONOMY LEVEL
<b>UNIT – I (SHORT ANSWERS)</b>		
1	Define ecology and ecosystem.	Remember
2	Differentiate between food chain and food web.	Understand
3	Briefly explain the importance of ecological pyramids	Remember
4	Define biogeochemical cycles? Explain their importance.	Understand
5	List the factors make a desert ecosystem	Remember
6	Briefly discuss about grassland ecosystem	Understand
7	Explain few important characteristics of a forest ecosystem	Remember
8	Explain why there are only 4 to 5 tropic levels in any ecosystem	Understand
9	Briefly discuss an aquatic ecosystem.	Remember
10	Define biomagnifications	Understand
11	Define bioaccumulation	Remember
12	Define carrying capacity?	Understand
13	Define primary production and secondary production.	Remember
14	Define ecological pyramids.	Understand
15	Define pyramid of energy.	Remember
16	Differentiate between grazing food chain detritus food chain.	Understand
17	List the different tropic levels of ecosystem?	Remember
18	Define decomposers?	Understand
19	Define photosynthesis process.	Remember
20	List the types of grasslands in India and two animal species found in the grass land .	Understand
<b>UNIT-II NATURAL RESOURCES(SHORT ANSWERS)</b>		
1	Discuss some of the water resources problems in India.	Remember
2	Discuss the problems of over exploitation of ground water.	Understand
3	Explain the causes for floods.	Remember
4	Discuss the methods of flood control.	Remember
5	Define desertification?	Remember
6	Define aquifer?	Remember
7	Enlist different surface and ground water resources.	Remember
8	List the environmental effects of using of mineral resources?	Remember
9	define mineral? What is its use?	Remember
10	Name the non renewable resources?	Remember
11	Define water logging?	Remember
12	Define soil erosion?	Remember
13	List the effects of soil pollution?	Remember
14	Differentiate soil texture and structure	Remember
15	Define green fuels?	Remember

16	Outline the role of geo thermal energy in India?	Remember
17	List the different type's energies which can be derived from the ocean?	Remember
18	Define solar cells.	Remember
19	Define pesticides? Mention it types.	Remember
20	List the different types of natural resources	Remember

**UNIT-III BIO – DIVERSITY & BIOTIC RESOURCES(SHORT ANSWERS)**

1	Enumerate the biogeographical classification of India.	Remember
2	define hot spots of biodiversity? Mention the three hot spots in India.	Understand
3	Differentiate between endanger and endemic species.	Remember
4	Define red data book?	Understand
5	Define endemic species? Name some endemic species in India.	Remember
6	List the indirect values of biodiversity.	Understand
7	Define biological diversity.	Remember
8	Differentiate genetic and species diversity.	Understand
9	Define vulnerable & Extinct species.	Remember
10	List out the names 10 Bio geo graphical regions of India.	Understand

**UNIT – I ECO SYSTEM (LONG ANSWER QUESTIONS)**

1	Explain energy flow pattern in different types of ecosystem	Remember
2	Discuss the major characteristics features of a river ecosystem different from lake ecosystem	Understand
3	List the main components of ecosystem and briefly describe the functions of each.	Remember
4	Explain the role of producers, consumers and decomposers in an ecosystem with practical example.	Understand
5	What would happen to an ecosystem if all its decomposer and detritus feeder were eliminate.	Remember
6	List the food chain and food web? give example and discuss their significance.	Understand
7	List the biogeochemical cycles? Explain nitrogen cycle with help of a diagram.	Remember
8	Define the ecological pyramids? Explain why some of these pyramids are upright while others are inverted in different ecosystem.	Understand
9	Explain energy flow of the ecosystem.	Remember
10	Name all the cycles that constitute the proper functioning of an ecosystem.	Understand

11	Explain bio magnification with examples.	Remember
12	Primary and secondary Productivity.	Understand
13	Explain about the structure of Ecosystem.	Remember
14	Write a detailed note on Carrying Capacity	Understand
15	What are the values getting from Ecosystem.	Remember
16	Define Ecosystem. Explain the importance and concept of ecosystem.	Understand
17	Define food chain . Explain the types of food chain.	Remember
18	Ocean Ecosystem of structure and function.	Understand
19	Classification of Ecosystem in Detailed.	Remember
20	Explain about Desert Ecosystem.	Understand

**UNIT-II NATURAL RESOURCES(LONG ANSWERS)**

1	List the Natural resources and write the classification of resources.	Remember
2	Explain the Big dams - Benefits and problems.	Understand
3	List the Mineral Resources, uses and exploitation?	Remember
4	List the alternate energy sources? Explain their present status, merits and demerits.	Understand
5	Explain the environmental impacts of (i) Fertilizer – Pesticides (ii). Over grazing.	Remember
6	Define mining. Explain various impacts of mineral extraction.	Understand
7	List the importance of forest ecological wealth of country?	Remember
8	Discuss about the soil texture, structure and its composition.	Understand
9	Write a short note on wind energy; also discuss its advantages and limitations.	Remember
10	List the different types of energies which can be derived from the ocean? Explain briefly along with their advantages and limitations.	Understand
11	Explain underground water usage effects.	Remember
12	Write a note on i)floods ii)drought	Understand
13	Define mining & explain types of mining.	Remember
14	Define land slides- explain major reasons to cause of land slides.	Understand
15	Write full notes on non renewable energy resources.	Remember
16	Explain about important solar harvesting devices.	Understand
17	Explain about Bio gas & its benefits.	Remember
18	Define wind Energy & Explain its Advantages , disadvantages.	Understand
19	Explain the types of soil erosion and its consequences.	Remember
20	Define tidal energy. Explain the types in detail.	Understand

UNIT-III BIO – DIVERSITY & BIOTIC RESOURCES (LONG ANSWER QUESTIONS)		
1	Define bio diversity? Explain different types of Bio diversity.	Remember
2	Summarize consumptive use value, productive use value, social value and ethical values of biodiversity.	Understand
3	How to study of biodiversity is beneficial to human life.	Understand
4	Define bio diversity. Explain genetic biodiversity, species diversity and ecosystem diversity?	Remember
5	Discuss the status of India as a mega diversity nation of biodiversity.	Understand
6	List the different services that are contributed in various ways by biodiversity?	Remember
7	Explain endangered species of India.	Understand
8	Discuss the concept of bio diversity at three hierarchical levels.	Remember
9	Define various species of biodiversity. Explain any 2 species with example in detailed.	Understand
10	Discuss the importance (uses) of biodiversity regarding direct and indirect values.	Remember

## INTRODUCTION TO AEROSPACE ENGINEERING

### Short Answer Questions

#### Unit-1

Sl. No	Question	Blooms Level
1.	Define Ornithopters	1
2.	Define microgravity	1
3.	Define magnetosphere filtering	1
4.	Discuss the features of magnetosphere	2
5.	Describe about the low earth orbit	1
6.	Describe about the law of gravitation	1
7.	Discuss what are meteorites	2
8.	Define meteoroids	1
9.	Discuss about the composition of earth's atmosphere	2
10.	Define glider	1
11.	Describe the lighter than air vehicles	1
12.	Describe the principle of hot air balloon	1
13.	State the law of gravitation	1
14.	Define the concept of zeppelins	1
15.	Define the term geo stationary	1
16.	Discuss what are van allen belts	2
17.	Define magnetopause	1
18.	Define stratopause	1
19.	Describe the layers of atmosphere	1
20.	Describe the solar flares	1

## Unit-2

Sl. No	Question	Blooms Level
1.	Define airfoil	1
2.	Define propulsion	1
3.	Define thrust	1
4.	Define lift	1
5.	Define drag	1
6.	Describe the moments acting on aircraft	1
7.	Describe the primary control surfaces of aircraft	1
8.	Draw a neat sketch of an aircraft showing the parts of the aircraft	1
9.	Draw a neat sketch of a space vehicle showing the parts of the aircraft	1
10.	Define aerodynamic center	1
11.	Define center of pressure	1
12.	Define camber line for an airfoil	1
13.	Describe the use of solid rocket boosters in the space vehicle	1
14.	Define angle of attack	1
15.	Describe what are non air breathing engines	1
16.	Discuss the use of combustor in the jet engine	2
17.	Discuss the principle of propeller engine	2
18.	Describe the pressure distribution on airfoil	1
19.	Define induced drag	1
20.	Define ram drag	1

### Unit-3

Sl. No	Question	Blooms Level
1.	Define manueuring	1
2.	Define steady level flight	1
3.	Define accelerated flight	1
4.	Write the condition for the steady level flight	1
5.	Define rolling moment	1
6.	Define pitching moment	1
7.	Define yawing moment	1
8.	Describe the control surfaces used to control flight of the aircraft	1
9.	Name the condition when lift is equal to weight and drag is equal to thrust	2
10.	Define the moment used for controlling the nose up and down moments	1

### Long Answer Questions

### Unit-1

Sl.No	Question	Blooms Level
1.	Discuss the temperature extremities of space using the graph.	2
2.	Explain the near earth radiative environment	3
3.	Explain the impact of space environment on the spacecraft	3
4.	Describe about micro - gravity and near earth radioactive environment and their effects on spacecrafts	1
5.	Discuss about space debris	2
6.	Compare the works carried out by the German engineer Lilienthal and Scot engineer Percy Pilcher during 19 <sup>th</sup> century in the area of building and experimenting gliders	3
7.	Demonstrate about ‘aerodromes’ developed by the American scientist Langley.	3
8.	Demonstrate the temperature distribution of standard atmosphere with graph.	3
9.	Outline the features incorporated by sir George cayley in his design of governable Parachutes during 19 <sup>th</sup> century	4
10.	Illustrate the importance of the balloons and the dirigibles in the World War II	3
11.	Describe the Montgolfier brothers contribution to flight	1

12.	Describe the contributions of zeppelin to dirigibles and why the dirigibles are called as zeppelins	1
13.	Discuss about the ISS and benefits of microgravity	2
14.	Describe about South Atlantic Anomaly	1
15.	Describe about the solar activities and galactic cosmic rays emitted by sun	1
16.	Describe the magnetosphere and its effects on the spacecraft	1
17.	Differentiate between the balloon flight and heavier than air vehicle flight	3
18.	Demonstrate the contribution of Wright brothers to aeronautics	3
19.	Describe the impacts of radiative particles on the spacecraft when a single particle hits the spacecraft single time	1
20.	Describe the cumulative dose effects	1

**Unit-2**

Sl. No	Question	Blooms Level
1.	Explain the pressure and shear stress distribution over the airfoil	3
2.	Differentiate between the engines used in aircrafts and rockets	3
3.	Explain the working principle of Turbofan engine	3
4.	Explain how thrust is produced	3
5.	Explain how lift is generated	3
6.	Discuss the types and sources of drag	2
7.	Discuss about the differences between turbojet and turbofan engine	2
8.	Explain the working principle of turbojet engine	3
9.	Derive the force and moment coefficients for an aircraft	3
10.	Differentiate between the aerodynamics on wings and aerodynamics on bodies	3
11.	Draw the graph for (a) $C_l$ vs $\alpha$ (b) $C_d$ vs $\alpha$ and explain each	3
12.	Define Mach Number and how is it related to compressibility of air	1
13.	Show that the thrust for flight $T = m(V_e - V_a)$	1
14.	Compare the aircraft and the rockets, explaining the major differences	3
15.	Explain how lift is obtained for an aircraft.	3
16.	Explain the working principle of turbofan engine	3
17.	Differentiate the nomenclature of NACA 4digit series, and NACA 5digit series of airfoils	3
18.	Differentiate between the pressure distribution of symmetrical airfoil and unsymmetrical airfoil	3
19.	Explain the importance of wings in generation of lift for an aircraft	3
20.	Explain the anatomy of helicopter	3

### Unit-3

Sl.No	Question	Blooms Level
1.	Describe the performance parameters acting on aircraft	1
2.	Describe the mission profile for an aircraft	1
3.	Explain the performance for an aircraft when in cruise	3
4.	Describe the performance of aircraft while takeoff	1
5.	Define the three axes of motion of an aircraft with the help of a sketch	1
6.	Discuss shortly on the effects of various controls available on an airplane to control the roll, pitch, and yaw motions of the aircraft	2
7.	Discuss about the effect of controls available on airplane to control the pitching moment	2
8.	Discuss about the Brequet range equation for an aircraft	2
9.	Discuss about the Brequet Endurance equation of an aircraft	2
10.	Describe the importance of control surfaces for an aircraft	1

Unit-1

**Short Answers**

Sl.No	Question	Blooms Level
1.	Define vector point function	
2.	Define scalar point function	
3.	Describe about vector differential operator	
4.	Write the Laplace equation	
5.	Describe unit normal vector	
6.	Define directional derivative	
7.	When a vector point function is irrotational	
8.	What is the condition for solenoidal vector ?	
9.	Describe the physical interpretation of divergence	
10.	If two points are P(1,0,2)Q(2,0,5)then find unit normal vector along the line PQ	
11.	Write the formulae for gradient, curl of a vector.	
12.	Define line integral?	
13.	Describe the work done by a force vector.	
14.	Describe about scalar potential function	
15.	Describe about surface ,volume integrals.	
16.	State Green's theorem in a plane.	
17.	State Stokes theorem.	
18.	State Gauss divergence theorem	
19.	1. Show that $\text{curl}(\text{grad}\varphi) = \bar{0}$	
20.	. Show that $\text{div}(\text{curl}\bar{f}) = 0$ .	

Unit-2

Sl.No	Question	Blooms Level
1.	Define periodic function?	
2.	2 Define Fourier series?	
3.	3. Describe about Fourier coefficients?	
4.	Explain Fourier series?	
5.	Which type of function can be expressed as Fourier series?	
6.	Write the formula for Fourier series?	
7.	Write Dirichlet conditions for the existence of Fourier series of a function $f(x)$ in the interval $(\alpha, \alpha + 2\pi)$	
8.	List out the Fourier coefficients.	
9.	Write the Euler's formulae?	
10.	Find $a_0$ for $f(x) = x$ in the interval $[0, 2\pi]$ .	
11.	Write the Fourier series for an even function?	
12.	Define the Fourier series for an arbitrary interval?	
13.	Define half range Fourier series?	
14.	Write half range Fourier cosine series?	
15.	Define Fourier transform?	
16.	State Fourier integral theorem	
17.	Write the formula for Fourier sine transform	
18.	Write the formula for Fourier cosine transform	
19.	Write half range Fourier sine series?	
20.	Write the Fourier series for an odd function?	

### Unit-3

Sl.No	Question	Blooms Level
1.	Define Interpolation , finite difference ?	
2.	Write a short note on Errors in polynomials interpolation	
3.	Write short note on equispaced data and un equispaced data?	
4.	Define finite difference and write the formulae for forward difference, backward difference .	
5.	write the Newton's forward interpolation formula	
6.	When Lagrange's interpolation formula is applied ?	
7.	What are the formulae for Gauss forward interpolation, Gauss backward interpolation	
8.	Define average operator?	
9.	Write the relation between $\Delta$ and $\nabla$ ?	
10.	Define interpolating polynomial?	

Unit-1

**LONG ANSWERS**

Sl.No	Question	Blooms Level
1.	If $\vec{F} = (5xy - 6x^2)\vec{i} + (2y - 4x)\vec{j}$ , evaluate $\int_C \vec{F} \cdot d\vec{r}$ along the curve c is xy-plane $y = x^3$ from (1,1) to (2,8).	
2.	Show that $F = (2xy + z^3)i + x^2j + 3xz^2k$ is conservative force field. Find the scalar potential. Find the work done is moving an object in this field from (1,-2,1) to (3,1,4).	
3.	Find the angle between the tangent planes to the surface $x \log z = y^2 - 1, x^2y = 2 - z$ at the point (1,1,1)	
4.	Verify divergence theorem for $\vec{F} = 4xi - 2y^2j + z^2k$ taken over the surface bounded by the region $x^2 + y^2 = 4, z = 0$ and $z = 3$	
5.	Find the work done is moving particle is the force field $\vec{F} = 3x^2i + (2xz - y)j + 3k$ along the curve $x^2 = 4y, 3x^3 = z$ from $x=0$ to $x=2$ .	
6.	Apply stoke's theorem to evaluate $\int_C ((x+y)dx + (2x-3)dy + (y+z)dz)$ where c is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6).	
7.	Evaluate $\int_S \vec{F} \cdot d\vec{s}$ where $F = (x + y^2)i - 2xj + 2yzk$ and s is the surface of the plane $2x+y+2z=6$ is the first octant.	
8.	. Show that $F = x\vec{i} + y^2\vec{j} + 3z^3\vec{k}$ is conservative force field. Find the scalar potential. Find the workdone is moving an object in this field from (1,-1,4) to (3,0,1).	
9.	. Evaluate by Green's theorem $\int_C [(cosx sin y - 2xy)dx + sin x cos y dy]$ where 'c' is the circle $x^2 + y^2 = 1$	
10.	Evaluate by stokes theorem $\iint_S curl \vec{F} \cdot \vec{n} ds$ where $\vec{F} = y^2i + x^2j - (x+z)\vec{k}$ and S comprising the planes $x=0, y=0, y=4, z=-1$ .	
11.	Prove that $curl(\varphi \vec{a}) = (\text{grad } \varphi) \times \vec{a} + \varphi curl \vec{a}$ .	
12.	Find the unit normal vector to the surface $x^2 + y^2 + 2z^2 = 26$ at the point (2,2,3).	

13.	Prove that if $\vec{r}$ is the position vector of any point in space, then $r^n \vec{r}$ is irrotational and solenoidal if $n=-3$	
14.	.If $\vec{r}$ is a position vector of the point $p(x,y,z)$ then prove that $\nabla(f(r)) = f'(r) \frac{\vec{r}}{ r }$	
15.	If $\vec{F} = (5xy - 6x^2)\vec{i} + (2y - 4x)\vec{j}$ , evaluate $\int_C \vec{F} \cdot d\vec{r}$ along the curve c in xy-plane $y = x^3$ from (1,1) to (2,8).	
16.	Show that $F = (2xy + z^3)i + x^2j + 3xz^2k$ is conservative force field. Find the scalar potential. Find the work done in moving an object in this field from (1,-2,1) to (3,1,4).	
17.	Verify stokes theorem for $\vec{F} = (y - z + 2)i + (yz + 4)j - xzk$ where s is the surface of the cube $x=0, y=0, z=0, X=2, y=2, z=2$ above the xy-plane.	
18.	Verify divergence theorem for $\vec{C} = 4xi - 2y^2j + z^2k$ taken over the surface bounded by the region $x^2 + y^2 = 4, z = 0$ and $z = 3$	
19.	Prove that $\nabla \left[ \nabla \cdot \left( \frac{\vec{r}}{r} \right) \right] = -\frac{2\vec{r}}{r^3}$	
20.	Apply stokes theorem to evaluate $\int_C ((x + y)dx + (2x - 3)dy + (y + z)dz)$ where c is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6).	

Unit-2

Sl.No	Question	Blooms Level
1.	<p>1. Find the Fourier series of the periodic function <math>f(x) = \begin{cases} -\pi, &amp; -\pi &lt; x &lt; \pi \\ x, &amp; 0 &lt; x &lt; \pi \end{cases}</math></p> <p>hence deduce that <math>\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \dots \dots = \frac{\pi^2}{8}</math></p>	
2.	<p>Obtain Fourier series for</p> <p>a. <math>f(x) = \begin{cases} x, &amp; -\pi &lt; x &lt; 0 \\ 0, &amp; 0 &lt; x &lt; \pi \\ x - \frac{\pi}{2}, &amp; \frac{\pi}{2} &lt; x &lt; \pi \end{cases}</math></p>	
3.	<p>The intensity of an alternating current after passing through a rectifier is given by</p> <p>i. <math>I(x) = \begin{cases} I_0 \sin x, &amp; 0 \leq x \leq \pi \\ 0, &amp; \pi \leq x \leq 2\pi \end{cases}</math></p> <p>ii. where <math>I_0</math> is maximum current and the period is <math>2\pi</math>. Express <math>I(x)</math> as a fourier series</p>	
4.	<p>. Expand the function <math>f(x) = x^2</math> as a fourier series in <math>[-\pi, \pi]</math> hence deduce that</p> <p><math>\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots \dots \dots = \frac{\pi^2}{12}</math></p>	
5.	Illustrate even and odd functions in fourier Properties	
6.	<p>. Find the inverse Fourier cosine transform <math>f(x)</math> of</p> <p><math>F_c(p) = a-p/2</math>, when <math>p &lt; 2a</math>  <math>= 0</math>, when <math>p \geq 2a</math></p>	
7.	<p>Expand the function <math>f(x) = x^2</math> as a fourier series in <math>[-\pi, \pi]</math></p> <p>hence deduce that <math>\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots \dots \dots = \frac{\pi^2}{6}</math></p>	
8.	<p>Find the Fourier series of the periodic function <math>f(x) = \begin{cases} -\pi, &amp; -\pi &lt; x &lt; \pi \\ x, &amp; 0 &lt; x &lt; \pi \end{cases}</math></p> <p>hence deduce that <math>\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \dots \dots = \frac{\pi^2}{8}</math></p>	

9.	Find a Fourier series to represent $f(x) = x^2$ in the interval $(0, 2\pi)$	
10.	Find a Fourier series representing $f(x) = 0, 0 < x < 2\pi$	
11.	Obtain the Fourier series expansion of $f(x)$ given that $f(x) = (\pi - x)/2$ in $0 < x < 2\pi$ and deduce that $1/1^2 + 1/2^2 + 1/3^2 + \dots = \pi^2/6$	
12.	. Expand $f(x) = x \cdot \sin x, 0 < x < 2\pi$ as a Fourier series	
13.	Find a Fourier series to represent the function $f(x) = e^x$ for $-\pi < x < \pi$ and hence derive a series for $\frac{\pi}{\sinh \pi}$	
14.	Find the Fourier series expansion to represent the function $f(x) = \begin{cases} \sin x \\ , -\pi < x < \pi \end{cases}$	
15.	Find the half-range cosine series and sine series for $f(x) = x$ in $0 < x < \pi$  hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \dots = \frac{\pi^2}{8}$	
16.	Find the finite Fourier sine transform of $f(x)$ defined by $f(x) = \left(1 - \frac{2}{\pi}\right)^2, 0 < x < \pi$ .	
17.	.Find the Fourier cosine and sine transforms of $e^{-ax}, a > 0$ and hence deduce the inverse formula.	
18.	state and prove fourier integral theorem	
19.	Find the half-range sine series and sine series for $f(x) = x^2$ in $0 < x < \pi$	
20.	Expand the function $f(x) = x^2$ as a fourier series in $[-\pi, \pi]$  hence deduce that $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$	

Unit-3

Sl.No	Question	Blooms Level												
1.	<p>1. Find <math>y(0.25)</math> by forward difference interpolation. Method given</p> <p>.</p> <table border="1"> <tr> <td>X</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td></tr> <tr> <td>Y</td><td>1</td><td>0.67</td><td>0.5</td><td>0.4</td><td>0.33</td></tr> </table>	X	0	0.5	1	1.5	2	Y	1	0.67	0.5	0.4	0.33	
X	0	0.5	1	1.5	2									
Y	1	0.67	0.5	0.4	0.33									
2.	<p>2. Find <math>F(2.5)</math> using the following table by using central differences.</p> <table border="1"> <tr> <td>X</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>F(X)</td><td>1</td><td>8</td><td>27</td><td>64</td></tr> </table>	X	1	2	3	4	F(X)	1	8	27	64			
X	1	2	3	4										
F(X)	1	8	27	64										
3.	<p>3. The following are the measurements T made on a curve recorded by the oscilloscope Represents a change of current I due to a change in the conditions of an electric current</p> <table border="1"> <tr> <td>T</td><td>1.2</td><td>2.0</td><td>2.5</td><td>3.0</td></tr> <tr> <td>I</td><td>1.36</td><td>0.58</td><td>0.34</td><td>0.20</td></tr> </table> <p>Using Lagrange's formula, find I at <math>T=1.6</math></p>	T	1.2	2.0	2.5	3.0	I	1.36	0.58	0.34	0.20			
T	1.2	2.0	2.5	3.0										
I	1.36	0.58	0.34	0.20										
4.	<p>Using Lagrange's formula, find a polynomial to the data and hence find <math>y(1)</math></p> <table border="1"> <tr> <td>X</td><td>-1</td><td>0</td><td>2</td><td>3</td></tr> <tr> <td>Y</td><td>-8</td><td>3</td><td>1</td><td>12</td></tr> </table>	X	-1	0	2	3	Y	-8	3	1	12			
X	-1	0	2	3										
Y	-8	3	1	12										
5.	<p>Find the interpolating polynomial <math>f(x)</math> from the table</p> <table border="1"> <tr> <td>X</td><td>0</td><td>1</td><td>4</td><td>5</td></tr> <tr> <td>F(X)</td><td>4</td><td>3</td><td>24</td><td>39</td></tr> </table>	X	0	1	4	5	F(X)	4	3	24	39			
X	0	1	4	5										
F(X)	4	3	24	39										
6.	<p>Find the second difference of the polynomial <math>x^4 - 12x^3 + 42x^2 - 30x + 9</math> with the interval of differencing <math>h = 2</math></p>													

7.	Find $f(2.5)$ using Newton forward formula from the following table																	
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr> <td>v</td><td>0</td><td>1</td><td>16</td><td>81</td><td>256</td><td>625</td><td></td></tr> </table>	X	0	1	2	3	4	5	6	v	0	1	16	81	256	625		
X	0	1	2	3	4	5	6											
v	0	1	16	81	256	625												
8.	Prove that $\Delta[x(x+1)(x+2)(x+3)] = 4(x+1)(x+2)(x+3)$ , if the interval of differencing is unity																	
9.	Find $F(1.5)$ for the following data																	
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td><td>1</td><td>2</td><td>3</td><td>4</td></tr> <tr> <td>F(X)</td><td>14</td><td>13</td><td>15</td><td>7</td></tr> </table>	X	1	2	3	4	F(X)	14	13	15	7							
X	1	2	3	4														
F(X)	14	13	15	7														
10.	Find $y(1.25)$ for the following data using Gauss forward interpolation formula																	
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>X</td><td>0</td><td>0.5</td><td>1</td><td>1.5</td><td>2</td></tr> <tr> <td>Y</td><td>2</td><td>0.48</td><td>0.55</td><td>0.6</td><td>0.58</td></tr> </table>	X	0	0.5	1	1.5	2	Y	2	0.48	0.55	0.6	0.58					
X	0	0.5	1	1.5	2													
Y	2	0.48	0.55	0.6	0.58													

## Short Answer Questions MECHANICS OF FLUIDS

### Unit-1

Sl. No	Question	Blooms Level
1.	Define fluid and fluid mechanics.	REMEMBER
2.	Define real and ideal fluids.	REMEMBER
3.	Define mass density and specific weight.	REMEMBER
4.	Distinct between statics and kinematics.	UNDERSTAND
5.	Define viscosity.	REMEMBER
6.	Define specific volume.	REMEMBER
7.	Define specific gravity.	REMEMBER
8.	State Newton's law of viscosity.	REMEMBER
9.	Classify the types of fluids.	APPLY
10.	Define kinematic viscosity.	REMEMBER
11.	Write down the expression for capillary fall.	REMEMBER
12.	State Pascal's law.	REMEMBER
13.	Define absolute and gauge pressure and vacuum pressure?	REMEMBER
14.	Define Manometer and list out it's types.	REMEMBER
15.	Write short notes on 'Differential Manometers'.	REMEMBER
16.	Define centre of pressure and total pressure.	REMEMBER
17.	Define buoyancy and centre of buoyancy.	REMEMBER
18.	Define Meta centre.	REMEMBER
19.	Define Hydro static Pressure.	REMEMBER
20.	Distinct between capillarity and surface tension.	UNDERSTAND

## Unit-2

Sl. No	Question	Blooms Level
1.	Classify the types of fluid flows?	APPLY
2.	Differentiate steady and unsteady flow?	ANALYZE
3.	Differentiate uniform and non – uniform flow?	ANALYZE
4.	Differentiate laminar and turbulent flow?	ANALYZE
5.	Differentiate compressible and incompressible flow?	ANALYZE
6.	Differentiate rotational and irrotational flow?	ANALYZE
7.	Differentiate one dimensional and two dimensional flow?	ANALYZE
8.	Differentiate local and convective acceleration?	ANALYZE
9.	Define velocity potential function?	REMEMBER
10.	Define stream function?	REMEMBER
11.	Define equipotential line?	REMEMBER
12.	Give the relation between stream function and velocity potential function?	UNDERSTAND
13.	Define circulation.	REMEMBER
14.	Define vorticity	REMEMBER
15.	Explain path line and streak line	UNDERSTAND
16.	Write the acceleration expressions for 3D flow.	REMEMBER
17.	Write velocity components in terms of velocity potential.	REMEMBER
18.	Write velocity components in terms of stream function	REMEMBER
19.	What do you mean by fluid kinematics	REMEMBER
20.	Write the continuity equation for 2D flow	REMEMBER

## Unit-3

Sl. No	Question	Blooms Level
1.	State Bernoulli's equation.	REMEMBER
2.	Give the Euler's equation of motion.	UNDERSTAND
3.	Write the expression rate of flow through venturimeter.	REMEMBER
4.	State the purpose orifice meter is used?	REMEMBER
5.	Define pitot tube and give its working principle?	REMEMBER
6.	State momentum equation and impulse momentum equation?	REMEMBER
7.	Define vorticity?	REMEMBER
8.	Differentiate forced and free vortex flows with examples?	ANALYZE
9.	Write the equation for motion for vortex flow and forced vortex flow.	REMEMBER
10.	Write the assumptions made in deriving Bernoulli's equation and state its applications.	REMEMBER
11.	Write the expression for rate of flow through venturimeter.	REMEMBER
12.	Explain Buckingham's theorem	UNDERSTAND
13.	Define Reynold's number.	REMEMBER
14.	Define Froude number.	REMEMBER
15.	Define dynamic similarity.	REMEMBER
16.	Give the types of forces in a moving fluid.	UNDERSTAND
17.	Define Total head.	REMEMBER
18.	Define kinetic head.	REMEMBER
19.	Define pressure head.	REMEMBER
20.	Write the forces considered for Euler's equation	REMEMBER

## **LONG ANSWER QUESTIONS**

### **UNIT-1**

Sl.No	Question	Blooms Level
1.	Determine the kinematic viscosity of oil having density $981 \text{ kg/m}^3$ . The shear stress at a point in oil is $0.2452 \text{ N/m}^2$ and velocity gradient at that point is $0.2 \text{ m/sec}$ .	APPLY
2.	Determine the specific gravity of a fluid having 0.05 poise and kinematic viscosity 0.035 stokes.	APPLY
3.	Determine the minimum size of glass tube that can be used to measure water level if the capillary rise is restricted to 2 mm. Consider surface tension of water in contact with air as $0.073575 \text{ N/m}$ .	APPLY
4.	Two horizontal plates are placed 1.25 cm apart. The space between them is being filled with oil of viscosity 14 poises. Calculate the shear stress in oil if upper plate is moved with a velocity of 2.5 m/s.	APPLY
5.	If the velocity profile of a liquid over a plate is a parabolic with the vertex 202 cm from the plate, where the velocity is 120 cm/sec. calculate the velocity gradients and shear stress at a distance of 0, 10 and 20 cm from the plate, if the viscosity of the fluid is 8.5 poise	APPLY
6.	A 15 cm diameter vertical cylinder rotates concentrically inside another cylinder of diameter 15.10 cm. both cylinders are 25 cm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. If a torque of 12.0 Nm is required to rotate the inner cylinder at 100 rpm determine the viscosity of the fluid.	APPLY
7.	The dynamic viscosity of oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90mm. the thickness of the oil film is 1.5 mm.	APPLY
8.	If the velocity distribution over a plate is given by $u=2/3 y - y^2$ in which U is the velocity in m/s at a distance y meter above the plate, determine the shear stress at $y = 0$ and $y = 0.15 \text{ m}$ .	APPLY
9.	Derive Pascal's law.	CREATE
10.	Derive expression for capillary rise and fall.	CREATE
11.	Two large plane surfaces are 2.4 cm apart. The space between the gap is filled with glycerin. Determine force is required to drag a thin plate of size 0.5 m between two large plane surfaces at a speed of 0.6 m/sec. if the thin plate is (i) in the middle gap (ii) thin plate is 0.8 cm from one of the plane surfaces? Take dynamic viscosity of fluid is 8.1 poise.	APPLY
12.	Calculate the capillary rise in a glass tube of 2.5 mm diameter when immersed vertically in (a) water (b) mercury. Take surface tension = $0.0725 \text{ N/m}$ for water and = $0.52 \text{ N/m}$ for mercury in contact with air.	APPLY

	The specific gravity for mercury is given as 13.6 and angle of contact of mercury with glass = $130^{\circ}$ .  .	
13.	Calculate the capillary effect in millimeters a glass tube of 4mm diameter, when immersed in (a) water (b) mercury. The temperature of the liquid is $20^{\circ}\text{C}$ and the values of the surface tension of water and mercury at $20^{\circ}\text{C}$ in contact with air are 0.073575 and 0.51 N/m respectively. The angle of contact for water is zero that for mercury $130^{\circ}$ . Take specific weight of water as $9790 \text{ N/m}^3$ .	APPLY
14.	The diameters of a small piston and a large piston of a large piston of a hydraulic jack at 3 cm and 10 cm respectively. A force of 80 N is applied on the small piston. Determine the load lifted by the large piston when: a. The pistons are at the same level b. Small piston in 40 cm above the large piston. The density of the liquid in the jack is given as $1000 \text{ kg/m}^3$ .	APPLY
15.	A U - Tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs. U tube is 10 cm and the free surface of mercury is in level with over the centre of the pipe. If the pressure of water in pipe line is reduced to $9810 \text{ N/m}^2$ , Calculate the new difference in the level of mercury. Sketch the arrangement in both cases.	APPLY
16.	Determine the total pressure and center of pressure on an isosceles triangular plate of base 4m and altitude 4m when it is immersed vertically in an oil of sp.gr.0.9. The base of the plate coincides with the free surface of oil.	APPLY
17.	A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of center of pressure on the plane surface when its upper edge is horizontal and coincides with water surface.	APPLY
18.	A rectangular plane surface is 2m wide and 3m deep. It lies in vertical plane in water. Determine the total pressure and position of center of pressure on the plane surface when its upper edge is horizontal and 2.5m below the free water surface.	APPLY
19.	The barometric pressure at sea level is 760mm of mercury while that on a mountain top is 735mm. If the density of air is assumed constant at $1.2 \text{ kg/m}^3$ , Calculate the elevation of the mountain top.	APPLY
20.	An open tank contains water upto a depth of 2m and above it an oil of sp.gr.0.9 for a depth of 1m. Find the pressure intensity (i) at the interface of the two liquids, and (ii) at the bottom of the tank.	APPLY

## **UNIT-2**

Sl. No	Question	Blooms Level
1.	Derive continuity equation from principle of conservation of mass.	CREATE
2.	Classify the types of fluid flows and explain all types of fluid flows	APPLY
3.	The velocity component for a two dimensional incompressible flow are given by $u = 3x - 2y$ and $v = -3y - 2x$ . Show that the velocity potential exists. Determine the velocity potential function and stream function.	APPLY
4.	Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one – third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. find the volume rate of flow in AB, the velocity in CD, the velocity in BC and the diameter of CE.	APPLY
5.	A fluid flow field is given by $\mathbf{V} = x^2 \mathbf{i} + y^2 \mathbf{j} - (2xyz + yz^2) \mathbf{k}$ prove that it is a case of possible steady incompressible flow. Calculate the velocity and acceleration at the point (2, 1, 3).	APPLY
6.	Derive the continuity equation for a three dimensional incompressible flow.	CREATE
7.	The velocity components in a two dimensional flow are $u = y^3/3 + 2x - x^2y$ and $v = xy^2 - 2y - x^3/3$ . Show that these components represent a possible case of an irrotational flow.	APPLY
8.	Explain Vorticity and circulation.	UNDERSTAND
9.	The water is flowing through a taper pipe of length 100 m having diameters 600 mm at the upper and 300 mm at the lower end, at the rate of 50 litres /s. the pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62 N/cm <sup>2</sup> .	APPLY
10.	The diameters of a pipe at the sections 1 and 2 are 10cm and 15cm respectively. Find the discharge through the pipe if the velocity of water flowing through the pipe at section 1 is 5m/s. Determine the velocity at section 2.	APPLY
11.	A 30cm diameter pipe, conveying water, branches into two pipes of diameters 20cm and 15cm respectively. If the average velocity in the pipe 30cm diameter is 2.5m/s, determine the discharge in this pipe. Also determine the velocity in 15cm pipe if the average velocity in 20cm diameter pipe is 2m/s.	APPLY
12.	A 25cm diameter pipe carries oil of sp.gr.0.9 at a velocity of 3m/s. At another section the diameter is 20cm. Determine the	APPLY

	velocity at this section and also mass flow rate of oil.	
13.	The velocity vector in a fluid flow is given $\mathbf{V}=4x^3yi-10x^2yj+2tk$ . Determine the velocity and acceleration of a fluid particle at (2,1,3) at time $t=1$ .	APPLY
14.	The following cases represent the two velocity components, determine the third component of velocity such that they satisfy the continuity equation: (i) $u=x^2+y^2+z^2$ ; $v=xy^2-yz^2+xy$ (ii) $2y^2$ , $w=2xyz$ .	APPLY
15.	The velocity potential function is given by $\phi=5(x^2-y^2)$ . Calculate the velocity components at the point (4,5).	APPLY
16.	The stream function is given by $\Psi=5x-6y$ . Calculate the velocity components and also magnitude and direction of the resultant velocity at any point.	APPLY
17.	If for a two dimensional potential flow, the velocity potential is given by $\phi=x(2y-1)$ . Determine the velocity at point p(4,5).	APPLY
18.	The stream function is given by $\Psi=2xy$ . Calculate the velocity at point p(2,3). Determine the velocity potential function $\phi$	APPLY
19.	The stream lines represented by $\Psi=x^2-y^2$ . Determine the velocity and direction at point (1,2).	APPLY
20.	In a two dimensional incompressible flow, the fluid velocity components are given by $u=x-4y$ and $v=-y-4x$ . Show that velocity potential exists. Determine also the stream function.	APPLY

## UNIT-3

Sl.No	Question	Blooms Level
1.	An oil of sp .Gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. the oil mercury differenyial manometer shows a reading of 25 cm.Calculate the discharge of oil through the horizontal venturimeter, Take C = 0.98.	APPLY
2.	Define vortex flow? What is the difference between Free vortex flowand forced vortex flow?	REMEMBER
3.	Derive the Euler's equation of motion	CREATE
4.	Derive the Bernoulli's equation.	CREATE
5.	A venturimeter of 20 mm throat diameter is used to measure the velocity of water in a horizontal pipe of 40 mm diameter. If the pressure difference between the pipe and throat sections is found to be 30 kPa then, neglecting frictional losses, determine the flow velocity.	APPLY
6.	The velocity of a water stream is being measured by a L-shaped Pilottubeand the reading is 20 cm. Calculate the approximate Value of velocity?	APPLY
7.	A Pitot-static tube ( $C = 1$ ) is used to measure air flow. With water in the differential manometer and a gauge difference of 75 mm, Calculate the value of air speed if $\rho = 1.16 \text{ kg/m}^3$ ?	APPLY
8.	A Pitot static tube is used to measure the velocity of water using a differential gauge which contains a manometric fluid of relative density 1.4. Determine the deflection of the gauge fluid when water flows at a velocity of 1.2 m/s (the coefficient of the tube may be assumed to be 1).	APPLY
9.	Water is flowing through a pipe of 5cm diameter under a pressure of $29.43 \text{ N/cm}^2$ and with a mean velocity of 2m/s. Determine total head or total energy per unit weight of the water at a cross section, which is 5m above the datum line.	APPLY
10.	A pipe through which water is flowing, is having diametres, 20cm and 10cm at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is given 4m/s. Determine the velocity head at sections 1 and 2 and also rate of discharge.	APPLY

**Department of Aeronautical Engineering  
MECHANICS OF SOLIDS  
Unit-I**

**Small answer questions**

Si.No	Question	Blooms Level
1.	Define the elastic property	Remember
2.	What do you mean by plasticity	Remember
3.	Define ductility of material	Remember
4.	Explain about brittle property	Apply
5.	Discuss about factor of safety	Understand
6.	Define stress and strain	Remember
7.	List the different types of stresses	Remember
8.	List the different types of strains	Remember
9.	State and discuss about Hooke's law	Understand
10.	Define poisons ratio	Remember
11.	What do you mean by bar of uniform strength	Remember
12.	Analyze the thermal stress	Apply
13.	What is bulk modulus of elasticity	Understand
14.	Define young's modulus	Remember
15.	Briefly explain about modulus of rigidity	Apply
16.	State the principle of shear stress	Remember
17.	What meant by lateral strain	Remember
18.	What do you mean by Strain energy	Remember
19.	Define the term Resilience	Remember
20.	What meant by longitudinal strain	

## MECHANICS OF SOLIDS

### Unit-I

#### Long answer questions

Si.No	Question	Blooms Level
1.	Explain the stress strain relations for brittle and ductile materials.	Apply
2.	A 20mm diameter brass rod was subjected to a tensile load of 40kN. Find the extension of length 200mm.	Apply
3.	A steel bar 15mm in diameter is pulled axially by a force of 10KN. If the bar is 250mm long. Calculate the strain energy stored per unit volume of the bar and the total strain energy stored by the bar. (Take $E = 2 \times 10^5$ MPa).	Apply
4.	Define volumetric strain and derive an expression for volumetric strain of a Circular rod	Apply
5.	The extension in a rectangular steel bar of length 400mm and thickness 10mm, is found to be 0.21mm. The bar tapers uniformly in width from 100mm to 50mm. If E for the bar is $2 \times 10^5$ N/mm <sup>2</sup> , determine the axial tensile load on the bar.	Apply
6.	A circular rod of diameter 16 mm and 500 mm long is subjected to a tensile force 40 kN. The modulus of elasticity for steel may be taken as 200 kN/mm <sup>2</sup> . Find stress, strain and elongation of the bar due to applied load,	Apply
7.	The ultimate tensile stress for a hollow steel column which carries an axial load of 2MN is 500N/mm <sup>2</sup> . If the external diameter of the column is 250mm, determine the internal diameter. Take FOS as 4.0	Apply
8.	A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60 kN is applied, the extension measured over a gauge length of 200mm is 0.12mm and contraction in diameter is 0.0045mm. Find Poisson's ratio and elastic constants E, G, and K	Apply
9.	Derive an expression between modulus of elasticity and modulus of rigidity	Apply
10.	Determine the changes in length and breadth and thickness of a steel bar which is 5m long, 40mm wide and 30mm thick and is subjected to an axial pull of 35kN in the direction of the length. Take $E = 2 \times 10^5$ N/mm <sup>2</sup> and Poisson's ratio 0.23.	Apply
11.	A compound bar consists of a circular rod of steel of 25 mm diameter rigidly fixed into a copper tube of internal diameter 25	Apply

	mm and external diameter 40 mm as shown in. If the compound bar is subjected to a load of 120 kN, find the stresses developed in the two materials Take $E_s = 2 \times 10^5 \text{ N/mm}^2$ and $E_c = 1.2 \times 10^5 \text{ N/mm}^2$	
12.	Determine the Poisson's ratio and bulk modulus of a material for which the Young's modulus is $1.2 \times 10^5 \text{ N/mm}^2$ and modulus of rigidity is $4.5 \times 10^4 \text{ N/mm}^2$ .	Apply
13.	A tensile test was conducted on a mild steel bar. The following data was obtained from the test: (i) Diameter of the steel bar = 3 cm (ii) Gauge length of the bar = 20cm (iii) Load at elastic limit = 250 kN (iv) Extension at a load of 150 kN = 0.21 mm (v) Maximum load = 380 kN (vi) Total extension = 60 mm (vii) Diameter of rod at failure = 2.25 cm Determine: (1) The Young's modulus (2) The stress at elastic limit (3) The percentage of elongation (4) The percentage decrease in area.	Apply
14.	Derive Expression for Young's modulus in terms of bulk modulus?	Apply
15.	Draw stress - strain diagram for mild steel. Indicate salient points and clearly explain the stages	Apply
16.	A bar 30 mm in diameter and 200mm long was subjected to an axial pull of 60 kN. The extension of the bar was found to be 0.1 mm, while decrease in the diameter was found to be 0.004 mm. Find the Young's modulus, Poisson's ratio, rigidity modulus and bulk modulus of the material of the bar.	Apply
17.	A reinforced concrete column 500x500 mm in section is reinforced with a steel bar of 25mm diameter, one in each corner, the column is carrying the load of 1000 KN Find the stresses induced in the concrete and steel bar. Take E for steel = $2.1 \times 10^5 \text{ N/mm}^2$ and E for concrete = $1.4 \times 10^3 \text{ N/mm}^2$	Apply
18.	A steel bolt of 20 mm diameter passes centrally through a copper tube of internal diameter 28 mm and external diameter 40 mm. The length of whole assembly is 600 mm. After tight fitting of the assembly, the nut is over tightened by quarter of a turn. What are the stresses introduced in the bolt and tube, if pitch of nut is 2 mm? Take $E_s = 2 \times 10^5 \text{ N/mm}^2$ and $E_c = 1.2 \times 10^5 \text{ N/mm}^2$	Apply
19.	A compound bar is made of a steel plate 50 mm wide and 10 mm thick to which copper plates of size 40 mm wide and 5 mm thick	Apply

	are connected rigidly on each side as shown in. The length of the bar at normal temperature is 1 m. If the temperature is raised by $80^\circ$ , determine the stresses in each metal and the change in length. Given $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ , $\alpha_c = 17 \times 10^{-6}/^\circ\text{C}$ , $E_s = 2 \times 10^5 \text{ N/mm}^2$ , $E_c = 1 \times 10^5 \text{ N/mm}^2$	
20.	Derive relation for change in length of the bar of uniformly tapering rectangular section subjected to an axial tensile load p. Derive the expression for strain energy when the load is applied with impact	Apply

## UNIT-II

### Short answer questions

Si.No	Question	Blooms Level
1.	Define beam. What are the types of Beams?	Remember
2.	Define and explain the following terms: Shear force, Bending moment, Shear force diagram & bending moment diagram	Remember
3.	What are the sign conventions for shear force & bending moment in general?	Remember
4.	Draw the S.F. & B.M. diagrams for simply supported beam of length L carrying a point load W at its middle point.	Remember
5.	What do you mean by point of contra flexure?	Remember
6.	Sketch any two types of supports used for a beam indicating the reactions in each case.	Remember
7.	A cantilever beam of span 4m is subjected to a UDL of 2 kN/m over its entire length. Sketch the bending moment diagram for the beam.	Apply
8.	Give the relationship between B.M. & S.F. and rate of loading in a beam.	Remember
9.	What is the maximum bending moment in a simply supported beam of span "L" subjected to UDL of "w" over entire span.	Remember

10.	How do you locate the point of maximum bending moment?	Remember
11.	Differentiate between hogging & sagging bending moment	Understand
12.	When will be Bending Moment maximum?	Remember
13.	What is the maximum bending moment in a simply supported beam of span L subjected to UDL of w over entire span.	Remember
14.	In a simply supported beam how will you locate point of maximum bending moment?	Remember
15.	What is Shear Force?	Remember
16.	What is Shear Force & Bending Moment Diagrams?	Remember
17.	Explain the important points for drawing Shear Force & Bending Moment diagrams.	Apply
18.	What are the types of loads? Explain.	Apply
19.	In which point the Bending Moment is maximum?	Remember
20.	Derive the relation between bending moment & shear force	Apply

## LONG ANSWER QUESTIONS

Si.No	Question	Blooms Level
1.	A simply supported beam of 10m long carries a uniformly distributed load 2kN/m entire length and point loads 1kN and 2kN at distances 2m and 5m from the left support. Draw the shear force and bending moment diagrams.	Apply
2.	A beam AB, 1.2m long, is simply-supported at its ends A and B and carries two concentrated loads, one of 10 kN at C, the other 15 kN at D. Point C is 0.4 m from A, point D is 1 m from A. Draw the S.F. and B.M. diagrams for the beam.	Apply
3.	A cantilever beam AB, 2.5 m long is rigidly built in at A and carries vertical concentrated loads of 8 kN at B and 12 kN at C, 1 m from A. Draw S.F. and B.M. diagrams for the beam.	Apply
4.	A beam AB, 5 m long, is simply-supported at the end B and at a point C, 1 m from A. It carries vertical loads of 5 kN at A and 20kN at D, the centre of the span BC. Draw the shear force and bending moment diagrams.	Apply
5.	A beam AB, 3 m long, is simply-supported at A and B. It carries a 16 kN concentrated load at C, 1.2 m from A, and a u.d.l. of 5 kN/m over the remainder of the beam. Draw the S.F. and B.M. diagrams and determine the value of the maximum B.M.	Apply
6.	A beam 4.2m long overhangs each of two simple supports by 0.6m. The beam carries a uniformly distributed load of 30 kN/m between supports together with concentrated loads of 20 kN and 30 kN at the two ends. Sketch the S.F. and B.M. diagrams for the beam and hence determine the position of any points of contraflexure.	Apply
7.	A simply supported beam has a span of 4m and carries a uniformly distributed load of 60 kN/m together with a central concentrated load of 40kN. Draw the S.F. and B.M. diagrams for the beam and hence determine the maximum B.M. acting on the	Apply

	beam.	
8.	A beam $ABCDE$ is simply supported at $A$ and $D$ . It carries the following loading: a distributed load of 30 kN/m between $A$ and $B$ ; a concentrated load of 20 kN at $B$ ; a concentrated load of 20 kN at $C$ ; a concentrated load of 10 kN at $E$ ; a distributed load of 60 kN/m between $D$ and $E$ . Span $AB = 1.5$ m, $BC = CD = DE = 1$ m. Calculate the value of the reactions at $A$ and $D$ and hence draw the S.F. and B.M. diagrams. What are the magnitude and position of the maximum B.M. on the beam?	Apply
9.	A simply supported beam has a span of 6m and carries a distributed load which varies in a linear manner from 30 kN/m at one support to 90 kN/m at the other support. Locate the point of maximum bending moment and calculate the value of this maximum. Sketch the S.F. and B.M. diagrams.	Apply
10.	A beam $ABCD$ is simply supported at $B$ and $C$ with $AB = CD = 2\text{m}$ ; $BC = 4\text{m}$ . It carries a point load of 60 kN at the free end $A$ , a uniformly distributed load of 60 kN/m between $B$ and $C$ and an anticlockwise moment of 80 kN m in the plane of the beam applied at the free end $D$ . Sketch and dimension the S.F. and B.M. diagrams, and determine the position and magnitude of the maximum bending moment.	Apply
11.	A cantilever beam of length 2m carries a uniformly distributed load of 2 kN /m over the whole length and a point load of 3 kN at the free end. Draw the SF and BM diagrams.	Apply
12.	A simply supported beam of length 8 m rests on supports 5 m apart, the right hand end is overhanging by 2 m and the left hand end is overhanging by 1m. The beam carries a uniformly distributed load of 5kN/m over the entire length. It also carries two point loads of 4kN and 6 kN at each end of them. The load 4kN is at the extreme left of the beam, whereas the load of 6 kN is at the extreme right of the beam. Draw S.F. and B.M. diagrams for the beam and find the points of contraflexure.	Apply
13.	A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw S.F. and B.M. diagrams for the beam and find the	Apply

	points of contraflexure.	
14.	A simply supported beam of length 8 m carries point loads of 4 kN, 10 kN and 7 kN at a distance of 1.5 m, 2.5 m and 2 m respectively from left end A. Draw S.F. and B.M. diagrams for the beam and also calculate the maximum B.M on the section.	Apply
15.	A cantilever of length 6 m carries a gradually varying load, zero at the free end to the 2 kN/m at the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.	Apply
16.	A cantilever of length 2 m carries a point load of 1kN at its free end and another load of 2 kN at a distance of 1 m from the free end. Draw the S.F. and B.M. diagrams for the cantilever.	Apply
17.	A cantilever of length 4 m carries point loads of 1kN, 2 kN and 3 kN at 1, 2 and 4 m from the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.	Apply
18.	A cantilever of length 2 m carries a uniformly distributed load of 3 kN/m run over a length of 1m from the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.	Apply
19.	A cantilever of length 5 m carries a uniformly distributed load of 2 kN/m over the entire length and a point load of 4 kN at the free end. Draw the S.F. and B.M. diagrams for the cantilever.	Apply
20.	A simply supported beam of length 5 m, carries a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away. There is also a clockwise couple of 1500 Nm applied at the centre of the beam. Draw S.F. and B.M. diagrams for the beam and also calculate the maximum B.M on the section.	Apply

## UNIT-III

### Short answer questions

Si.No	Question	Blooms Level
1.	Define the bending stress.	Remember
2.	What do you mean by simple bending	Remember
3.	What do you mean by pure bending	Remember
4.	Explain about neutral axis	Apply
5.	What is the meaning of strength of section	Remember
6.	Discuss about section modulus	Understand
7.	Define the term Moment of resistance	Remember
8.	Explain about neutral surface	Apply
9.	Compare the section modulus for circular section and hollow circular section	Understand
10	What do you mean by beams with uniform bending strength	Remember

### Long answer questions

Si.No	Question	Blooms Level
1.	A steel plate of width 60mm and thickness 10mm is bent into a circular arc of radius 10m. Determine the max stress induced and the bending moment which will produce the max stress. Take $E = 2 \times 10^5 \text{ N/mm}^2$ .	
2.	Calculate the max stress induced in a cast iron pipe of external diameter 40mm of internal diameter 20mm and of length 4m when the pipe is supported at its ends and carries a point load of 80N at the center.	
3.	Derive bending equation $M/I = f/y = E/R$ .	
4.	Discuss the assumptions involved in the theory of simple bending	
5.	A cast iron beam has an I-section with top angle $100\text{mm} \times 40\text{mm}$ , web $140\text{mm} \times 20\text{mm}$ and bottom angle $180\text{mm} \times 40\text{mm}$ . If tensile stress is not to exceed 35MPa and compressive stress 95MPa, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6.5m	
6.	Derive section modulus for rectangular and circular beams	
7.	A circular steel pipe of external diameter 60 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2 m. If	

	permissible stress in steel is 150 N/mm <sup>2</sup> , determine the maximum concentrated load that can be carried by it at mid span	
8.	A circular bar of simply supported span 1 m has to carry a central concentrated load of 800 N. Find the diameter of the bar required, if permissible stress is 150 N/mm <sup>2</sup> .	
9.	A cantilever of 3 m span, carrying uniformly distributed load of 3 kN/m is to be designed using cast iron rectangular section. Permissible stresses in cast iron are $f = 30 \text{ N/mm}^2$ in tension and $f_c = 90 \text{ N/mm}^2$ in compression. Proportion the section suitably	
10.	The cross-section of a cast iron beam is as shown in Fig. 10.14(a). The top flange is in compression and bottom flange is in tension. Permissible stress in tension is 30 N/mm <sup>2</sup> and its value in compression is 90 N/mm <sup>2</sup> . What is the maximum uniformly distributed load the beam can carry over a simply supported span of 5 m?	

## THERMODYNAMICS

### Short Answer Questions

#### Unit-1

Sl. No	Question	Blooms Level
1.	Define System, Surrounding, Boundaries and Universe	1
2.	Define Control Volume	1
3.	Define types of systems	1
4.	Discuss the differences between Macroscopic and Microscopic Viewpoints	2
5.	Describe about the Concept of Continuum	1
6.	Describe about the Thermodynamic Equilibrium	1
7.	Discuss the term State	2
8.	Define Property	1
9.	Discuss about the Process	2
10.	Define thermodynamic cycle	1
11.	Describe the Exact & Inexact Differentials	1
12.	Describe the principle of Reversibility	1
13.	State Irreversible Process	1
14.	Define the Causes for Irreversibility	1
15.	Define the Quasi – static Process	1
16.	Discuss Reference Points	2
17.	Define Point and Path functions	1
18.	Define Steady Flow Energy Equation	1
19.	Describe the Zeroth Law of Thermodynamics	1
20.	Describe the First Law of Thermodynamics	1

## Unit-2

Sl. No	Question	Blooms Level
1.	Define Thermal Reservoir	1
2.	Define Heat Engine	1
3.	Define Heat pump	1
4.	Define the equation for efficiency	1
5.	Define the equation for Coefficient of performance	1
6.	Describe the relation between the COP of refrigerator and heat pump	1
7.	Describe Availability	1
8.	Draw Carnot's principle	1
9.	Draw entropy and temperature plot	1
10.	Define Irreversibility	1
11.	Define Entropy	1
12.	Define the statement of Kelvin-Planck	1
13.	Describe the statement of Clausius	1
14.	Define PMM1	1
15.	Describe PMM2	1
16.	Discuss when an inventor claims to have developed an engine that takes in 105 MJ at a temperature of 400 K, rejects 42 MJ at a temperature of 200 K, and delivers 15 kWh of mechanical work. Would you advise investing money to put this engine in the market?	2
17.	Discuss the power required to drive the plant. A refrigeration plant for a food store operates as a reversed Carnot heat engine cycle. The store is to be maintained at a temperature of – 5°C and the heat transfer from the store to the cycle is at the rate of 5 kW. If heat is transferred from the cycle to the atmosphere at a temperature of 25°C	2
18.	Describe the location of absolute zero on the Celsius scale. If 20 kJ are added to a Carnot cycle at a temperature of 100°C and 14.6 kJ are rejected at 0°C.	1
19.	Define Refrigerator principle	1
20.	Define the entropy of universe	1

### Unit-3

Sl. No	Question	Blooms Level
1.	Define Equation of State	1
2.	Define specific and Universal Gas constants	1
3.	Define change in Internal Energy	1
4.	Write Vader Waals Equation of State	1
5.	Define flow process	1
6.	Define non-flow process	1
7.	Define Compressibility chart	1
8.	Describe Throttling Processes	1
9.	Name perfect gas laws	2
10.	Define Free Expansion Processes	1

### Long Answer Questions

### Unit-1

Sl.No	Question	Blooms Level
1.	Discuss the First law of thermodynamics applied to a Process	2
2.	Explain First law of Thermodynamics and its Corollaries	3
3.	Explain Constant Volume gas Thermometer	3
4.	Describe Joule's Experiments	1
5.	Discuss First law of thermodynamics applied to a flow system	2
6.	Compare Types of Systems	3
7.	Demonstrate Quasi – static Process	3
8.	Demonstrate Energy in State and in Transition	3
9.	Outline Steady Flow Energy Equation	4
10.	The resistance of a platinum wire is found to be 11,000 ohms at the ice point, 15.247 ohms at the steam point, and 28.887 ohms at the sulphur point. <b>Calculate</b> the constants A and B in the equation $R = R_0(1 + At + Bt^2)$ . And plot R against t in the range 0 to 660°C.	3
11.	A new scale N of temperature is divided in such a way that the freezing point of ice is 100°N and the boiling point is 400°N. <b>Calculate</b> is the temperature reading on this new scale when the temperature is 150°C? At what temperature both the Celsius and the new temperature scale reading would be the same?	3
12.	The piston of an oil engine, of area 0.0045 m <sup>2</sup> , moves downwards 75 mm, drawing in 0.00028 m <sup>3</sup> of fresh air from the atmosphere. The pressure in the cylinder is uniform during the process at 80 kPa, while the atmospheric pressure is 101.325 kPa, the difference being due to the flow resistance in the induction pipe and the inlet valve. <b>Estimate</b> the displacement work done by the air finally in the cylinder.	2

13.	An engine cylinder has a piston of area $0.12 \text{ m}^2$ and contains gas at a pressure of $1.5 \text{ MPa}$ . The gas expands according to a process which is represented by a straight line on a pressure-volume diagram. The final pressure is $0.15 \text{ MPa}$ . <b>Calculate</b> the work done by the gas on the piston if the stroke is $0.30 \text{ m}$ .	3
14.	A mass of $1.5 \text{ kg}$ of air is compressed in a quasi-static process from $0.1 \text{ MPa}$ to $0.7 \text{ MPa}$ for which $pv = \text{constant}$ . The initial density of air is $1.16 \text{ kg/m}^3$ . <b>Determine</b> the work done by the piston to compress the air.	5
15.	A mass of gas is compressed in a quasi-static process from $80 \text{ kPa}$ , $0.1 \text{ m}^3$ to $0.4 \text{ MPa}$ , $0.03 \text{ m}^3$ . Assuming that the pressure and volume are related by $pv^n = \text{constant}$ , <b>Calculate</b> the work done by the gas system.	3
16.	A single-cylinder, double-acting, reciprocating water pump has an indicator diagram which is a rectangle $0.075 \text{ m}$ long and $0.05 \text{ m}$ high. The indicator spring constant is $147 \text{ MPa per m}$ . The pump runs at $50 \text{ rpm}$ . The pump cylinder diameter is $0.15 \text{ m}$ and the piston stroke is $0.20 \text{ m}$ . <b>Calculate</b> the rate in $\text{kW}$ at which the piston does work on the water.	3
17.	A single-cylinder, single-acting, 4 stroke engine of $0.15 \text{ m}$ bore develops an indicated power of $4 \text{ kW}$ when running at $216 \text{ rpm}$ . <b>Calculate</b> the area of the indicator diagram that would be obtained with an indicator having a spring constant of $25 \times 10^6 \text{ N/m}^3$ . The length of the indicator diagram is $0.1$ times the length of the stroke of the engine.	3
18.	In a cyclic process, heat transfers are $+ 14.7 \text{ kJ}$ , $- 25.2 \text{ kJ}$ , $- 3.56 \text{ kJ}$ and $+31.5 \text{ kJ}$ . <b>Calculate</b> is the net work for this cyclic process.	3
19.	A domestic refrigerator is loaded with food and the door closed. During a certain period the machine consumes $1 \text{ kWh}$ of energy and the internal energy of the system drops by $5000 \text{ kJ}$ . <b>Calculate</b> the net heat transfer for the system.	3
20.	A system composed of $2 \text{ kg}$ of the above fluid expands in a frictionless piston and cylinder machine from an initial state of $1 \text{ MPa}$ , $100^\circ\text{C}$ to a final temperature of $30^\circ\text{C}$ . If there is no heat transfer, <b>Calculate</b> the net work for the process.	3

Unit-2

Sl. No	Question	Blooms Level
1.	Explain the Limitations of the First Law	2
2.	Differentiate between the two statements of thermodynamic second law statements	4
3.	Explain Kelvin-Planck and Clausius Statements and their Equivalence	2
4.	Explain Carnot cycle and its specialties	2
5.	Explain Thermodynamic scale of Temperature	2
6.	Discuss Clausius Inequality	2
7.	Discuss Principle of Entropy Increase	2
8.	Explain Thermodynamic Potentials	2
9.	Derive Gibbs and Helmholtz Functions	6
10.	Derive Maxwell Relations	6
11.	Explain Elementary Treatment of the Third Law of Thermodynamics	2
12.	A heat engine operates between the maximum and minimum temperatures of 671°C and 60°C respectively, with an efficiency of 50% of the appropriate Carnot efficiency. It drives a heat pump which uses river water at 4.4°C to heat a block of flats in which the temperature is to be maintained at 21.1°C. Assuming that a temperature difference of 11.1°C exists between the working fluid and the river water, on the one hand, and the required room temperature on the other, and assuming the heat pump to operate on the reversed Carnot cycle, but with a COP of 50% of the ideal COP, <b>Calculate</b> the heat input to the engine per unit heat output from the heat pump. Why is direct heating thermodynamically more wasteful?	3
13.	An ice-making plant produces ice at atmospheric pressure and at 0°C from water. The mean temperature of the cooling water circulating through the condenser of the refrigerating machine is 18°C. <b>Evaluate</b> the minimum electrical work in kWh required to produce 1 tonne of ice (The enthalpy of fusion of ice at atmospheric pressure is 333.5 kJ/kg).	5
14.	Two Carnot engines A and B are connected in series between two thermal reservoirs maintained at 1000 K and 100 K respectively. Engine A receives 1680 kJ of heat from the high-temperature reservoir and rejects heat to the Carnot engine B. Engine B takes in heat rejected by engine A and rejects heat to the low-temperature reservoir. If engines A and B have equal thermal efficiencies, <b>determine</b> : (a) The heat rejected by engine B (b) The temperature at which heat is rejected by engine A (c) The work done during the process by engines, A and B respectively. If engines A and B deliver equal work, determine (d) The amount of heat taken in by engine B	5

	(e) The efficiencies of engines A and B	
15.	It takes 10 kW to keep the interior of a certain house at 20°C when the outside temperature is 0°C. This heat flow is usually obtained directly by burning gas or oil. <b>Calculate</b> the power required if the 10 kW heat flow were supplied by operating a reversible engine with the house as the upper reservoir and the outside surroundings as the lower reservoir, so that the power were used only to perform work needed to operate the engine.	3
16.	<b>Analyze</b> that the COP of a reversible refrigerator operating between two given temperatures is the maximum.	4
17.	A heat engine operating between two reservoirs at 1000 K and 300 K is used to drive a heat pump which extracts heat from the reservoir at 300 K at a rate twice that at which the engine rejects heat to it. If the efficiency of the engine is 40% of the maximum possible and the COP of the heat pump is 50% of the maximum possible, what is the temperature of the reservoir to which the heat pump rejects heat? <b>Calculate</b> the rate of heat rejection from the heat pump if the rate of heat supply to the engine is 50 kW	3
18.	Two kg of water at 80°C are mixed adiabatically with 3 kg of water at 30°C in a constant pressure process of 1 atmosphere. <b>Calculate</b> the increase in the entropy of the total mass of water due to the mixing process (cp of water = 4.187 kJ/kg K).	3
19.	Water is heated at a constant pressure of 0.7 MPa. The boiling point is 164.97°C. The initial temperature of water is 0°C. The latent heat of evaporation is 2066.3 kJ/kg. <b>Calculate</b> the increase of entropy of water, if the final state is steam.	3
20.	Ten grams of water at 20°C is converted into ice at -10°C at constant atmospheric pressure. Assuming the specific heat of liquid water to remain constant at 4.2 J/gK and that of ice to be half of this value, and taking the latent heat of fusion of ice at 0°C to be 335 J/g, <b>calculate</b> the total entropy change of the system.	3

Unit-3

Sl.No	Question	Blooms Level
1.	<b>Calculate</b> the mass of air contained in a room $6 \text{ m} \times 9 \text{ m} \times 4 \text{ m}$ if the pressure is 101.325 kPa and the temperature is 25°C?	3
2.	A certain gas has $P_c = 0.913$ and $V_c = 0.653 \text{ kJ/kg K}$ . <b>Calculate</b> the molecular weight and the gas constant R of the gas.	3
3.	From an experimental determination the specific heat ratio for acetylene $\text{C}_2\text{H}_2$ is found to 1.26. <b>Calculate</b> the two specific heats.	3
4.	A supply of natural gas is required on a site 800 m above storage level. The gas at $-150^\circ\text{C}$ , 1.1 bar from storage is pumped steadily to a point on the site where its pressure is 1.2 bar, its temperature $15^\circ\text{C}$ , and its flow rate $1000 \text{ m}^3/\text{hr}$ . If the work transfer to the gas at the pump is 15 kW, <b>Calculate</b> the heat transfer to the gas between the two points. Neglect the change in K.E. and assume that the gas has the properties of methane ( $\text{CH}_4$ ) which may be treated as an ideal gas having $\gamma = 1.33$ ( $g = 9.75 \text{ m/s}^2$ ).	3
5.	A constant volume chamber of $0.3 \text{ m}^3$ capacity contains 1 kg of air at $5^\circ\text{C}$ . Heat is transferred to the air until the temperature is $100^\circ\text{C}$ . <b>Calculate</b> the work done, the heat transferred, and the changes in internal energy, enthalpy and entropy.	3
6.	One kg of air in a closed system, initially at $5^\circ\text{C}$ and occupying $0.3 \text{ m}^3$ volume, undergoes a constant pressure heating process to $100^\circ\text{C}$ . There is no work other than pdv work. <b>Calculate</b> (a) the work done during the process, (b) the heat transferred, and (c) the entropy change of the gas.	3
7.	Air in a closed stationary system expands in a reversible adiabatic process from $0.5 \text{ MPa}, 15^\circ\text{C}$ to $0.2 \text{ MPa}$ . <b>Calculate</b> the final temperature, and per kg of air, the change in enthalpy, the heat transferred, and the work done.	3
8.	Explain the Throttling and Free Expansion Processes in detail.	2
9.	What do you <b>understand</b> by Deviations from perfect Gas Model?	2
10.	Explain the terms involved in Vader Waals Equation of State	2

## **BEE I Mid Question Bank**

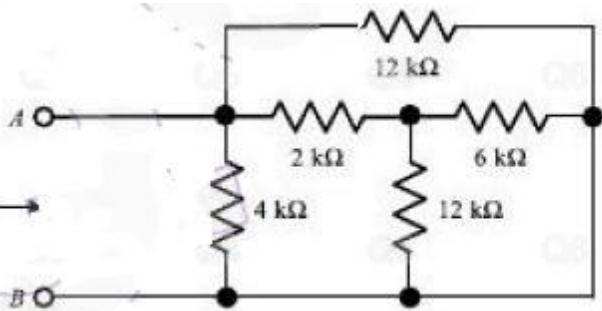
### **Unit 1**

#### **Short answer questions**

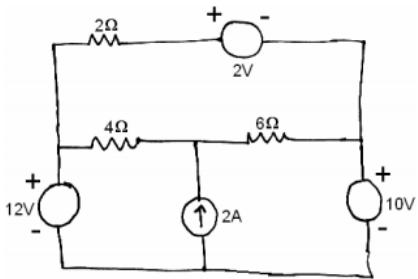
1. State Kirchhoff's voltage law?
2. State Kirchhoff's current law?
3. Explain ideal voltage source?
4. Explain ideal current source?
5. Discuss the applications of both series and parallel combination?
6. Discuss resistor, capacitor, and inductor with relevant expression?
7. Explain the equations for resistors in equivalent delta. If the resistors Ra, Rb and Rc are connected electrically in star?
8. State Ohm's law?
9. State Superposition Theorem?
10. State Thevinins Theorem?
11. State Maximum power transfer theorem?
12. Explain difference between series and parallel resistive circuit ?
13. Mention the limitations of Ohm's Law?
14. Explain source transformations?
15. Give the difference between nodal analysis and mesh analysis?
16. What is a mesh?
17. Define super mesh?
18. Define reference node?
19. Explain with relevant diagram dependent sources?
20. Explain how voltage source with a source resistance can be converted into an equivalent current source?

## Long answer questions

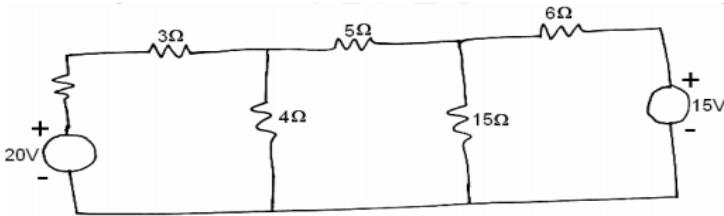
- Find the equivalent resistance for the following circuit?



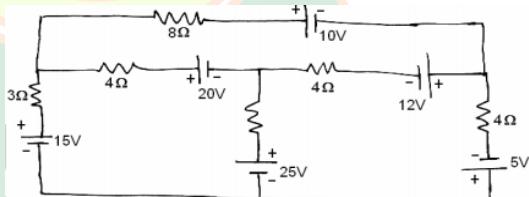
- If current flowing through a coil changes at the rate of 2amps/sec and the voltage induced is 20v. Find the inductance value?
- Explain two capacitors are connected in series then  $C_{eq} = (C_1 * C_2) / (C_1 + C_2)$ ?
- Explain derivation of star-delta conversion equations?
- Explain derivation of delta-star conversion equations?
- Explain in detail the volt-ampere relationship of R, L and C elements with neat diagrams?
- Explain about series and parallel networks of resistor?
- Explain about series and parallel networks of inductor?
- Explain classification of network elements?
- Explain superposition theorem?
- Explain Thevinin's theorem?
- Derive the condition for maximum power transfer theorem?
- Use mesh analysis to find currents through the loops in circuit shown. Evaluate power dissipated in  $6\Omega$  resistance.



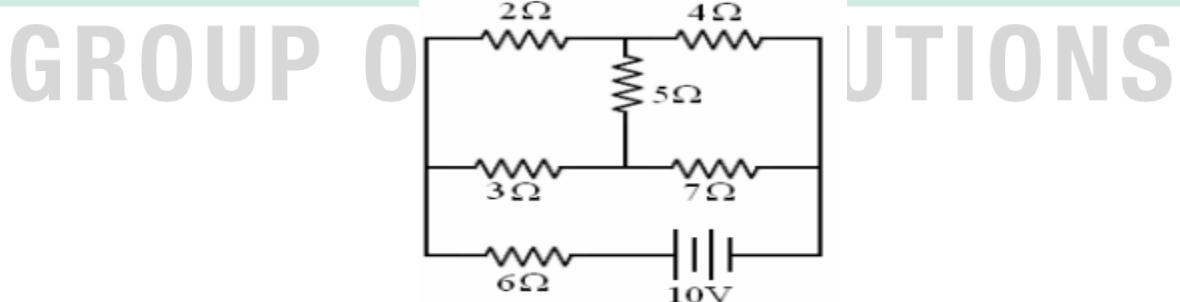
14. Find the power dissipated in the  $15\Omega$  resistance of the network shown. Use nodal analysis.



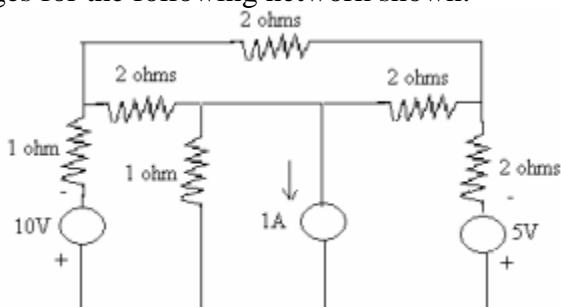
15. Find the power supplied by 15 V source in the circuit shown using mesh analysis.



16. Calculate the current in the  $5\Omega$  resistor using Kirchhoff's laws for the network shown in below figure.



17. Obtain the node voltages for the following network shown.



18. Obtain the equivalent expression
- For 4 capacitors in series connected & parallel connected
  - For 3 inductors in series connected & parallel connected
19. If current flowing through a coil changes at the rate of 5amps/sec and the voltage induced is 30v. Find the inductance value?
20. Explain two inductors are connected in parallel then  $L_{eq} = (L_1 \cdot L_2) / (L_1 + L_2)$ ?



## **Unit 2**

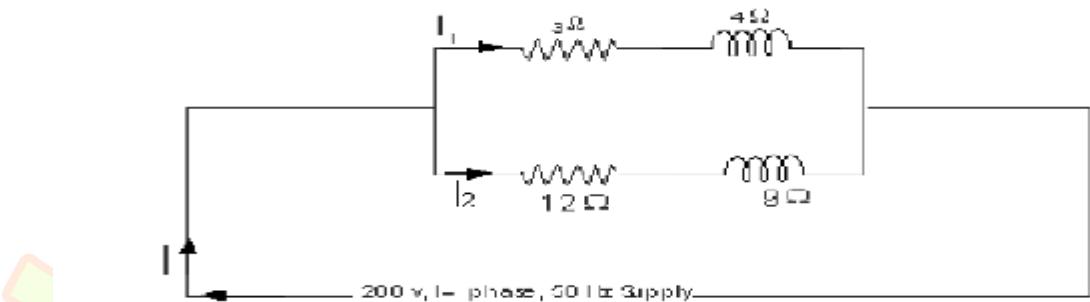
### **Short answer questions**

1. Define Impedance?
2. Define admittance?
3. Define susceptance?
4. Define conductance?
5. Define Power factor?
6. Write about series RL circuit?
7. Write about series RC circuit?
8. Explain behavior of RLC Series circuit?
9. Explain about rectangular form
10. Explain about polar form?
11. Explain the significance of J-Operator?
12. Define RMS value?
13. Define average value?
14. Define form factor?
15. Define peak factor?
16. Discuss what are the advantages of AC quantities?

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17. Explain conversion from rectangular form to polar form?
18. Explain conversion from polar form to rectangular form?
19. Define frequency and time period?
20. Define phase and phase difference?

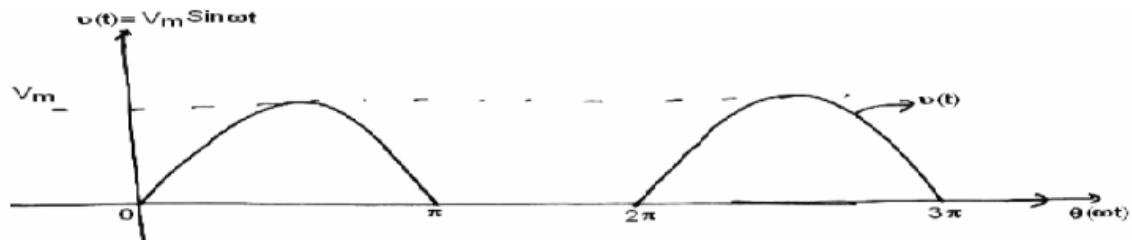
## Long answer questions

1. A circuit consists of a resistance of 15ohm, a capacitance of 200 micro Farad and inductor of 0.05H all in series. If supply of 230V, 50Hz is applied to the ends of circuit. Calculate i) Current in the coil ii) Potential difference across each element?
2. Write about series RC circuit?
3. Solve the following parallel circuit and find out current in each branch and total current as shown in figure

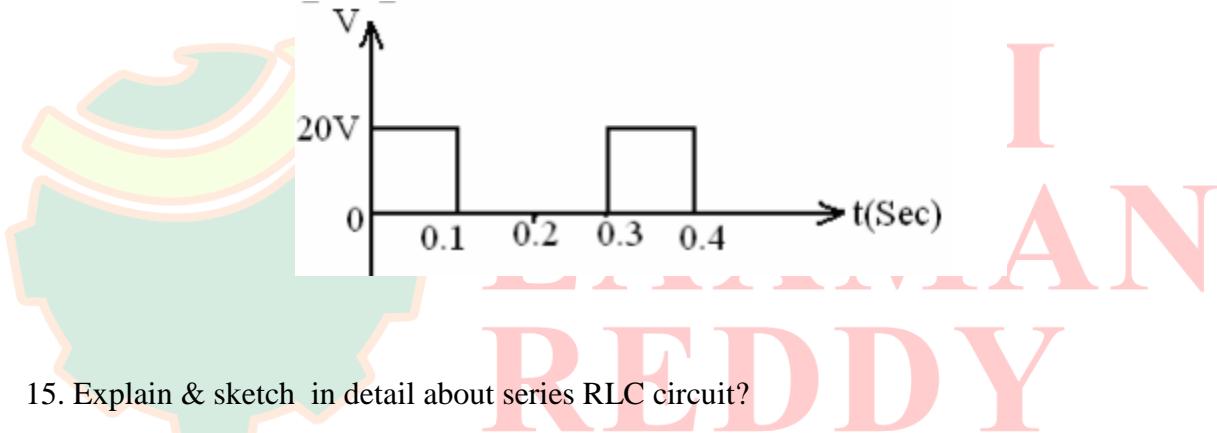


4. Define power factor. What is its Importance in a.c. Circuits?
5. The impedances of a parallel circuit are  $Z_1=(6+j8)\Omega$  and  $Z_2=(8-j6)\Omega$ . If the applied voltage is 120V, find
  - a. current and power factor of each branch
  - b. overall current and power factor of the circuit
  - c. Power Consumed by each impedance. Draw phasor diagram.
6. A series circuit consisting of a  $10\Omega$  resistor, a  $100\mu F$  capacitor and a  $10 \text{ mH}$  inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance, current in the circuit, the power factor and power dissipated in the circuit
7. Show that average power consumed by pure inductor and capacitor is zero.
8. A resistance of  $16\text{ohms}$  is connected in series to an inductance of  $20\text{mH}$  and the series combination is connected to an ac supply of 230V, 50Hz. Determine the current through the elements and power delivered by the source, draw the phasor diagram.
9. What is Admittance? Which are its two components? State its unit. How the admittance is expressed in rectangular and polar form?
10. Explain Admittance, Susceptance and Conductance. Draw the admittance triangle

11. Derive the expression for  $i(t)$  for RL series circuit when excited by a sinusoidal source.
12. Calculate the RMS, and average values of an alternating quantity given by  
 $v = 20 \cos(314t)$ ?
13. Find form factor and peak factor?



14. Compute the RMS and average values of square wave form shown in below figure 3.



15. Explain & sketch in detail about series RLC circuit?
16. Derive the expression for  $i(t)$  for RC series circuit when excited by a sinusoidal source.

17. Calculate the RMS, and average values of an alternating quantity given by  
 $v = 10 \cos(314t)$ ?

18. A series circuit consisting of a  $20\Omega$  resistor, a  $10\mu F$  capacitor and a  $100\text{ mH}$  inductor is driven by a  $50\text{ Hz}$  a.c. voltage source of maximum value  $10$  volts. Calculate the equivalent Impedance, current in the circuit, the power factor and power dissipated in the circuit?

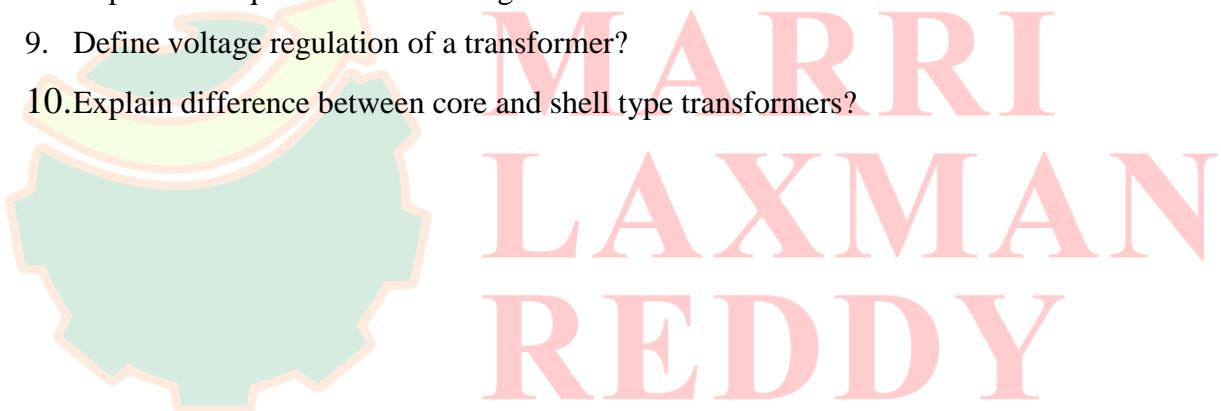
19. A circuit consists of a resistance of  $25\text{ ohm}$ , a capacitance of  $20\text{ micro Farad}$  and inductor of  $0.5\text{ H}$  all in series. If supply of  $230\text{ V}$ ,  $50\text{ Hz}$  is applied to the ends of circuit. Calculate i) Current in the coil ii) Potential difference across each element?

20. A resistance of  $6\text{ ohms}$  is connected in series to an inductance of  $200\text{ mH}$  and the series combination is connected to an ac supply of  $230\text{ V}$ ,  $50\text{ Hz}$ . Determine the current through the elements and power delivered by the source, draw the phasor diagram?

## **Unit 3**

### **Short answer questions**

1. Define transformation ratio?
2. Explain the purpose of laminating the core in a transformer?
3. Explain the emf equation of a transformer and define each term. ?
4. Explain does transformer draw any current when secondary is open? Why?
5. Explain mutual induction principle?
6. Explain why the transformer measured in KVA?
7. Discuss what are the parts are in parts in transformer?
8. Explain the equivalent circuit diagram of transformer?
9. Define voltage regulation of a transformer?
- 10.Explain difference between core and shell type transformers?

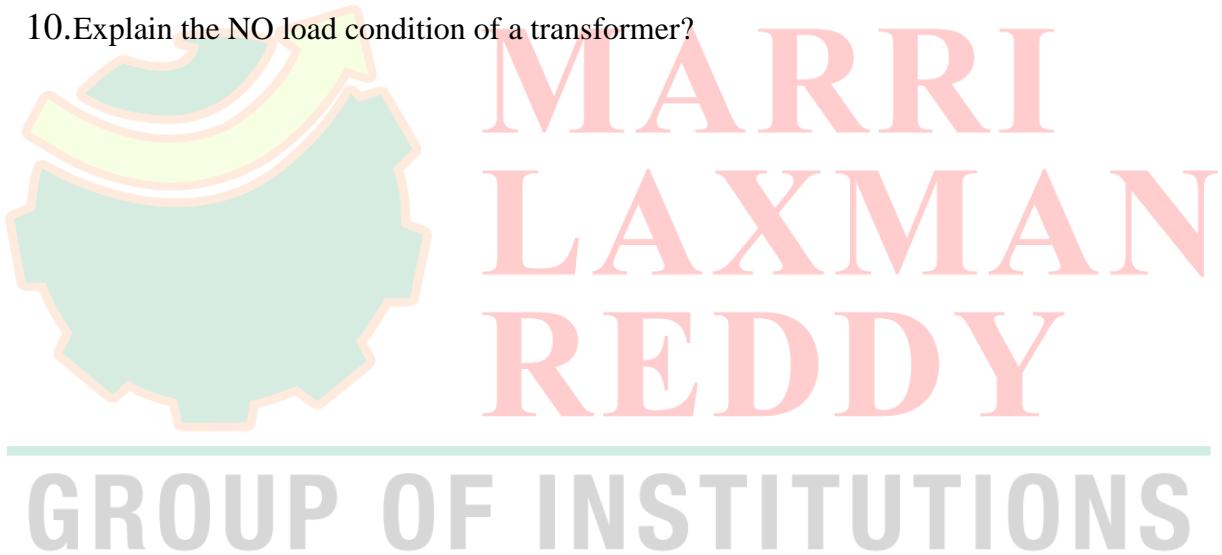


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**GROUP OF INSTITUTIONS**

## **Long answer questions**

1. Describe the construction details of transformer?
2. Explain the principle of operation of transformer?
3. Explain the OC test of a single phase transformer?
4. Explain the losses in a Transformer?
5. Obtain the condition for maximum efficiency of a transformer?
6. Obtain the equivalent circuit of a single phase transformer?
7. Explain the SC test of a single phase transformer?
8. Explain the determination of deducing equivalent circuit parameters?
9. Explain the ON load condition of a transformer?
- 10.Explain the NO load condition of a transformer?



**III B.TECH I SEM COMPUTER SCIENCE AND ENGINEERING**  
**DIGITAL LOGIC DESIGN**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m (BLOOMS LEVEL-1) and 10 questions(2m or 2.5 or 3m) OF BLOOMS  
LEVEL 2 & 3 from each unit(20+10 from unit 1 and 20+20 from unit 2 Short Answer  
Questions I m questions      blooms level-1**

1. Convert the following numbers with indicated bases to decimal  $(101101)_2, (736.4)_8, (F3)_{16}, (101001.1011)_2?$
2. List out the different types of positional and non positional number systems
3. What are complements explain r's complement with examples?
4. Explain the importance and applications of gray code in digital electronics
5. Differentiate binary and BCD codes
6. Explain the process of constructing Boolean expression from truth table?
7. Define logic circuit?
8. List the various types of logic gates?
9. Construct XOR gate logic operation using only NAND Gates
10. Apply Boolean Algebra theorems and postulates to simplify :  $ABC' + ABC + BCD$
11. Find the result of  $10 + (-8)$  apply 2's complement
12. Convert  $111011010$  to equivalent gray code.
13. Convert  $100010101011$  gray code to binary
14. What is a self complementary code?
15. Explain basic logic gates with neat sketch?
16. Construct XOR operation using only NOR gates
17. Discuss Canonical form of Boolean expressions
18. Explain various forms of representing signed numbers?
19. Discuss the IEEE standard for floating point numbers

20. Explain how to convert octal number to decimal number.

### **Long Answer Questions (2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Show how can the following operations be performed using :
  - a. Octal – Hexadecimal conversion
  - b. 111011.011 to decimal conversion
  - c. Binary to BCD form
2. Prove  $\sqrt{41} = 5$
3. Implement XOR with minimum no. of Gates
4. Design a mechanism of detecting overflow in 2's complement addition
5. Draw the logic diagram for XNOR operation
6. Explain all basic gates with logic symbol and truth table
7. What are error detection codes. Explain parity bit with example?
8. Derive logic diagram for odd parity generator and checker?
9. Explain 7 bit Hamming code with example?
10. Discuss the merits and demerits of Hamming code?

### **UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)**

20 questions 1m and 10 questions (2m or 2.5 or 3m)

**Short Answer Questions      I m questions blooms level-1**

1. What is a K Map? Explain its purpose.
2. Explain how K Map indexing is done?
3. What do you mean by sum of products?
4. Differentiate is the difference between SOP and POS?
5. Simplify  $F=\sum(1, 2, 6, 5)$  using K Map?
6. Discuss how to use don't care conditions in K Map?
7. What is code used to identify each cell in a K Map and why?
8. Why gray code is used to index cells in K Map?
9. State the importance of two level gate implementation?
10. Define Pair, Quad and Octet in K Map

### **Long Answer Questions**

1. Discuss how don't care conditions are useful and when do they come with example.
2. Simplify  $F=\sum(1,2,6,5)$  using K Map?
3. Simplify  $F=\sum(1,2,6,9)$  with don't care conditions at X(11,13,14)
4. Implement XNOR using only NAND. Draw the logic diagram
5. Implement XOR using only NAND. Draw the logic diagram
6. What if an octet is formed in a 3 variable K Map? Discuss in detail.
7. Simplify  $F=\sum(0,2,6,9,11,13,15)$  using K Map
8. What is SSOP (Standard sum of products)?
9. What is SPOS (Standard product of sums)?
10. Explain two level gate implementation in detail?

### **Half unit of Unit 3**

#### **Short answer questions**

1. What is a combinational logic circuit
2. Explain design procedure of a combinational logic circuit
3. Define half adder and discuss how addition of two bits is performed
4. Differentiate half adder and full adder
5. What is n bit binary adder? Draw the logic diagram
6. List any five combinational logic circuits along with their purpose
7. What is code converter
8. What is a magnitude comparator
9. Can we perform both addition and subtraction using single logic circuit?  
Explain
10. Simplify  $F=\sum(1,2)$  and  $\sum(3)$  and draw the logic diagram

#### **Long answer questions**

1. Derive logic for full adder
2. Implement full adder using only NAND gates
3. Derive logic for converting binary to BCD
4. Discuss how combinational logic circuits work and their construction procedure
5. Construct full adder using only NAND gates.

## **UNIT-1 (Short answer questions)**

1. **Define** an algorithm?
2. **Define** asymptotic notations: big ‘Oh’, omega and theta?
3. **Define** recursive algorithm?
4. **Differentiate** between recursive and iterative algorithms?
5. **Describe** best case, average case and worst case efficiency of an algorithm?
6. **Define** time complexity of an algorithm?
7. **Define** space complexity of an algorithm.
8. **Define** data structure?
9. **Define** ADT?
10. **List** linear and nonlinear data structures?
11. **Define** Linked List?
12. **List** the different types of linked lists?
13. **List** the basic operations carried out in a linked list?
14. **List** the advantages and disadvantages of linked list?
15. **Differentiate** between array and linked list?
16. **Define** Doubly Linked List?
17. **Define** Circularly Linked List?
18. **List** the advantages and disadvantages of doubly linked list?
19. **Define** Circular Linked List?
20. **Define** Sparse Matrix?

## **UNIT-2 (Short answer questions)**

1. **Define** Stack?
2. **List** the applications of stack?
3. **Define** Queue?
4. **List** the applications of queue?
5. **Differentiate** Stack and Queue?
6. **List** out the basic operations that can be performed on a stack ?
7. **List** out the basic operations that can be performed on a queue?
8. **List** the different types of queues?
9. **Define** Circular Queue?
10. **Define** DEQUEUE?
11. **List** the operations that can be performed on DEQUEUE?
12. **State** the different ways of representing expressions?
13. **List** how Stacks and Queues are represented in data structure ?
14. **Discuss** which data structure used in recursion?
15. **Convert** the infix expression  $(a+b)-(c*d)$  into post fix form?
16. **Define** Circular Queue full condition?
17. **Define** Dequeue Overflow condition?
18. **Discuss** in the linked list implementation of the queue class, where does the push member function place the new entry on the linked list?
19. **List** the advantages and disadvantage of Queue?
20. **List** the advantages of circular queue?

## **UNIT-3 (Short answer questions)**

1. **Define** Tree?
2. **List** the applications of Trees?
3. **Define** path in a tree?
4. **Define** Binary Tree?
5. **Define** full binary tree?
6. **Define** complete binary tree?
7. **Define** a right-skewed binary tree and Left-skewed binary tree?

8. **Define** heap?
9. **Define** Priority Queue?
10. **Differentiate** Max-heap and Min-heap?

### **UNIT-1 (long answer questions)**

1. **Discuss** various the asymptotic notations used for best case average case and worst case analysis of algorithms.
2. **Explain** Performance Analysis in Detail.
3. **Define** recursion. Explain with it GCD of two numbers and factorial of a number.
4. **Explain** concatenation of singly linked lists
5. **Explain** circular linked list operations
6. **Explain** doubly linked list operations
7. **List** the advantages and disadvantages of doubly linked list over singly linked list?
8. **Explain** the applications of doubly linked lists
9. **Explain** the following operations in a doubly linked list.
  - a. Insert an element
  - b. Delete an element
  - c. Reverse the list
10. **Explain** time and space complexities in detail
11. **Explain** the different operations on singly liked list
12. **Explain** how to insert a node at particular position in double linked list.
13. **Explain** Array and Linked representation of Sparse Matrix
14. **Write** a C function to insert an element in between two nodes in a double linked list
15. **Explain** how to create circular linked list and insert nodes at end.
16. **Explain** linear and non linear data structures with examples
17. **Given a** single linked list, write a function to swap every two nodes  
e.g 1->2->3->4->5->6 should become 2->1->4->3->6->5
18. **Given a** double linked list, write a function to print alternate nodes.  
e.g 1->2->3->4->5->6 should become 1->3->5
19. **Given a** double linked list, write a function to print list in reverse order.  
e.g 1->2->3->4->5->6 should become 6->5->4->3->2->1.
20. Write a C function to insert at beginning of double linked list.

### **UNIT-2 (long answer questions)**

1. **Write** an algorithm for basic operations on Stack using arrays
2. **Explain** the procedure to evaluate postfix expression
3. **Evaluate** the following postfix expression:  $6\ 2\ 3\ +\ -\ 3\ 8\ 2\ /+\ *2\ |3\ +$
4. **Explain** the procedure to convert infix expression into postfix expression form.
5. **Write** an algorithm for basic operations on simple Queue using arrays
6. **Write** an algorithm for basic operations on circular queue
7. **Explain** DEQUEUE ADT and its operations
8. **Implement** a queue using two stacks.
9. **Implement** a Circular queue of integer of user specified size and write the functions for enqueue() and dequeue()
10. **Convert** the following expression  $A + (B * C) - ((D * E + F) / G)$  into post form.
11. **Implement** a stack using two queues.
12. **Write** an algorithm for basic operations on Stack using linked lists
13. **Explain** the operations on simple Queue using linked lists
14. **Write** an algorithm for basic operations on DEQUEUE using arrays
15. **Write** an algorithm for basic operations on DEQUEUE using linked lists
16. **List** the advantages of circular queue over simple queue.
17. **List** the real time applications of stacks and queue.
18. **Convert** the following expression  $A + (B * C) - ((D * E + F) / G)$  into prefix form.
19. **Write** a C program to read a sequence of characters and print them in reverse order (use

- stack)
20. **Evaluate** the following postfix expression  $5\ 9\ 3\ +\ 4\ 2\ * *\ 7\ + *$  using stack show the content of stack at each step.

### **UNIT-3 (long answer questions)**

1. **Explain** Binary tree ADT.
2. **Explain** tree traversals with example
3. **Explain** different methods of binary tree representation
4. **Explain** how a general tree can be represented as a Binary Tree.
5. **Write** the recursive algorithm to traverse a tree in preorder and explain with example
6. **Write** the recursive algorithm to traverse a tree in Inorder and explain with example
7. **Write** the recursive algorithm to traverse a tree in post order and explain with example
8. **Explain** the properties of binary tree with example.
9. **Discuss** various ways of representation of trees.
10. **Write** the inorder, preorder and postorder of the following expression.

$$A + (B * C) - ((D * E + F) / G)$$

## **EDC I Mid Question bank**

### **Unit-I**

#### **20 short Questions 1M (Blooms level-1)**

1. Define Drift current.
2. Give examples for donor atoms.
3. Give the cut-in voltage for silicon and germanium.
4. Write the diode current equation.
5. Draw the diode equivalent model.
6. Define diode AC resistance.
7. Define PIV.
8. Define form factor.
9. Define rectifier.
10. Draw half wave rectifier circuit.
11. Write the importance of filters.
12. Define ripple factor.
13. Draw the symbols of diode and zener diode.
14. Define TUF.
15. List the applications of diode.
16. Write the equation for efficiency.
17. Draw the NPN transistor symbol.
18. Write the condition for transistor active region.
19. Give the transistor operating modes.
20. Define transistor amplifier.

#### **20 Long Questions 2M/2.5M/3M (Blooms level-2&3)**

1. Explain the qualitative theory of PN Junction diode.
2. Determine the conductivity of pure silicon at 300k given,  $n_i=1.65 \times 10^{10} /cm^3$ .
3. Describe the V-I Characteristics of PN junction diode.

4. Explain about breakdown mechanisms in semiconductor diode.
5. For a germanium semiconductor of the p-type conductivity in  $80\text{mho}/\text{cm}$ . determine the hole concentration, given  $m_p=1800\text{cm}^2/\text{v}\cdot\text{sec}$  and  $n_i=2.5*10^{13}/\text{cm}^3$
6. Describe transition capacitance
7. Explain the principle of operation of tunnel diode.
8. Discuss about zener diode characteristics.
9. Draw and explain the characteristics of varactor diode.
10. Describe static and dynamic resistance levels of diode.
11. Draw and explain the characteristics of silicon controlled rectifier.
12. Discuss about photo diode characteristics.
13. Discuss the effect of temperature on diode V-I characteristics.
14. Distinguish between ideal and practical diodes.
15. Derive the expression for diode equation.
16. Explain the barrier formation of PN junction diode.
17. Distinguish between zener and normal diode.
18. A tunnel diode has  $|dI/dV|_{\text{max}}=1/12\text{mho}$ . a resistor 'R' is connected in parallel with the tunnel diode. It is desired that the combination should not exhibit negative resistance. Determine the value of R.
19. Determine the ratio of forward current  $I_F$  to reverse current  $I_R$  for the same voltage of  $0.07\text{V}$  in both case , at room temperature, in case of a germanium diode.
20. A germanium semiconductor has donor atoms= $2.2*10^{10}/\text{cm}^3$  and acceptor atoms= $3.2*10^{14}/\text{cm}^3$ . $n_i=6.25*10^{26}/\text{cm}^3$ .determine the values of n and p.

## Unit-II

- 1) Draw a circuit diagrams to show two methods of producing a negative output voltage from a half wave rectifies briefly explain.
- 2) Draw the circuit diagram of a bridge rectifies to gather with its input waveforms. Explain the operation of the circuit by identifying the forward biased and reverse biased diodes during each half cycle of the input waveform.
- 3) AHWR circuit has a  $25\text{V(rms)}$  sinusoidal are input and a  $600\Omega$  load resistance calculate the peak output voltage ,peak load current when  $V_f =0.7\text{V}$

- 4) A HWR circuit produces a 55mA peak current in an  $820\Omega$  load resistor calculate the rms ac input voltage and the diode peak reverse voltage if  $V_f = 0.7u$ .
- 5) Compare half wave and full wave rectifier with capacitor fitting, reffering to capacitor for a given ripple amplitude, ripple factor, TUF & % regulation.
- 6) For a rectifier circuit with capacitor filtering, explain ripple voltage and diode peak reverse voltage.
- 7) Explain the function of a transformer in a dc power supply & discuss the factors involved in the specification of power supply transform.
- 8) Draw and explain the circuit diagram of full wave rectifier with L-Section filter.
- 9) Derive the expression for regulation and efficiency of half wave rectifier.
- 10) Draw the circuit of full wave rectifier and derive the expression for
  - a. Dc current b. rms current c. DC load voltage
- 11) Define the following terms with necessary equations.
  - b. Form factor b. peak factor c. efficiency
- 12) Calculate the average value of output voltage, peak diode current and PIV of half wave rectifier. ( $V_s = 12V$  rms and  $R_L = 100$  ohms)
- 13) Design a c-section filter and obtain its expression for ripple factor
- 14) A full wave rectifier has forward resistance of 20 ohms for each diode. A DC volt meter connected accross the load of 1K ohm reads 55.4 volts . Calculate I rms, average voltage, ripple factor and secondary voltage .
- 15) Explain the operation of L-filter .
- 16) Draw the circuit diagram for full wave bridge rectifier and explain its operation.
- 17) Draw the circuit diagram for  $\pi$ -filter and explain its operation.
- 18) Explain the operation of zener voltage regulator.
- 19) Draw the circuit diagram for LC-filter and explain its operation.
- 20) Distinguish between half wave and full rectifiers.

### **Unit-III**

- 1) Draw a neat sketch of an PNP transistor structure and explain the carrier flow when the junctions are unbiased.
- 2) With the help of bias voltages explain the function of pnp transistor.
- 3) Determine  $\alpha_{dc}$  if  $I_E=2.8\text{mA}$  and  $I_B=20\mu\text{A}$  of a BJT. Also calculate the value of  $\beta$  of the transistor.
- 4) Define  $I_{CBo}$  and  $I_{CeO}$  .how they are related?
- 5) Given  $\beta_{dc}=180$  and  $I_c=2.0\text{mA}$ , find  $I_E$  and  $I_B$  and  $I_c$  of BJT.
- 6) Define carrier life time and base width modulation or early effect.
- 7) Derive an expression for collector current  $I_C$  in CB configuration.
- 8) Explain the output characteristics of CE configuration.
- 9) Explain how transistor can be used as a amplifier.
- 10) Explain the input characteristics of CB configuration.

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**MID I QUESTION BANK**

**Short Answer Questions**

1. Define Tautology
2. Define Statement?
3. Define Contradiction?
4. Define Contingency?
5. Define Converse?
6. Define Inverse?
7. Define contrapositive?
8. Define Duality principle?
9. Define Tautological Implication?
10. Define negation?
11. Define modus ponens rule?
12. Define Disjunctive syllogism?
13. Define predicative logic?
14. Define modus tollence?
15. Define open statement?
16. Define Quantifiers?
17. Define free and bound variables?
18. Define premise?
19. What is consistency?
20. Define CP Rule

**Long Answer Questions**

1. (a) Associate a truth table for each of three (easy) compound statements

i.  $(p \rightarrow q) \wedge (\neg p \rightarrow q)$       ii)  $p \rightarrow (\neg q \vee r)$

2. Explain the negation of the following statements.

- i. Jan will take a job in industry or go to graduate school.
- ii. James will bicycle or run tomorrow.
- iii. If the processor is fast then the printer is slow.

3. (a) Explain the following implication without constructing the truth table.

i.  $(P \rightarrow Q) \rightarrow Q \Rightarrow (P \vee Q)$

ii.  $P \rightarrow Q \Rightarrow P \rightarrow (P \wedge Q)$

4. Explain that the proposition  $P \wedge \neg Q$  and  $(P \vee Q) \wedge (\neg P \wedge \neg Q)$  are contradiction

5. Let p,q and r be the propositions.

- i. P: you have the flee
- ii. q: you miss the final examination.
- iii. r: you pass the course.

Explain the following proposition into statement form.

i.  $P \rightarrow q$

ii.  $\neg p \rightarrow r$

iii.  $q \rightarrow \neg r$

6. Explain the following proposition into statement form.

Let p,q and r be the propositions.

P: you have the flee

q: you miss the final examination.

r: you pass the course

1)  $p \vee q \vee r$

2)  $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$

3)  $(p \wedge q) \vee (\neg p \wedge r)$

7 Explain the inverse, converse and contra positive of the implication

8. Construct the truth table for the following statement

$$(\neg P \leftrightarrow \neg Q) \leftrightarrow (Q \leftrightarrow R)$$

9.Explain that the following statements are logically equivalent without using truthtable.

$$(P \rightarrow Q) \wedge (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \wedge R)$$

$$10.\text{Show that } (\exists x) (p(x) \wedge Q(x)) \Rightarrow (\exists x) (p(x) \wedge \exists (x) Q(x))$$

11 Construct the truth table for the following statement

$$(\neg P \leftrightarrow \neg Q) \leftrightarrow (Q \leftrightarrow R)$$

12.Explain that the following statements are logically equivalent without using truthtable.

$$(P \rightarrow Q) \wedge (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \wedge R)$$

13.State  $p \rightarrow s$  can be derived from  $\neg p \vee q$ ,  $\neg q \vee r$ ,  $r \rightarrow s$

14.Prove by indirect method that  $\neg q, p \rightarrow q, p \vee r \Rightarrow r$

15.verify the following premises

i)If clifton does not live in france,then he does not speak french

ii)Clifton doesnot drive a Datsun

iii)If clifton lives in france,then he rides a bicycle

iv)Either Clifton speakes French or he drives a datsun

v)Hence Clifton rides a bicycle

16.Change in symbolic form by using Quantifiers

1.All men are good

2.No men are good

3.Some men are good

4.Some men are not good

17Change in symbolic form by using Quantifiers

1.Something is good

2.Everything is good

3.Nothing is good

4.Some thing is not good

18.Obtain DNF of  $\neg(p \vee q) \leftrightarrow (p \wedge q)$

19 $((p \wedge q) \wedge \neg r) \rightarrow ((\neg p \vee \neg q) \wedge r)$

20.Show that  $(svr)$  is tautologically implied by  $(pvq) \wedge (p \rightarrow r) \wedge (q \rightarrow s)$

Unit 2

## Level-1

1. Define binary relation?
2. Define Equivalence Relation ?
3. Define Compatibility Relation?
4. Define Reflexive Relation?
5. Define Transitive Closure?
6. Define Symmetric Relation?
7. Define Anti Symmetric Relation?
8. Define Asymmetric Relation?
9. Define Transitive Relation?
10. Define Compatibility Relation?
11. Define function?
12. Define Bijective function?
13. Define Algebraic Structures?
14. Define Group?
15. Define monoid?
16. Define homomorphism?
17. Define Isomorphism?
18. Define Subgroup?
19. Define inverse Function?
20. Define identity function?

## Unit-2

### level 2 and above

- 1.1. Draw Hasse diagram representing the partial ordering  $\{(A, B) : A \leq B\}$  on the power set  $P(S)$  where  $S = \{a, b, c\}$  where  $\leq$  represents subset relation.
2. Define group. Show that set of integers are group under addition.
3. Show that the function  $f(x, y) = x - y$  is partial recursive.
4. Show that every finite set is primitive recursive.
5. Let  $f: R \rightarrow R$  and  $g: R \rightarrow R$  where  $R$  is set of real numbers. Find  $fog$  and  $gof$  where  $f(x) = x^2 - 2$  and  $g(x) = x + 4$ .
6. Determine whether above functions are injective, surjective and bijective.

7. Let  $\langle S, * \rangle$  be a semi group and  $z \in S$  be a left zero. Show that for any  $x \in S$ ,  $x * z$  is also a left zero.

8. Prove or disprove the following

Every finite group of order  $n$  is isomorphic to a permutation group of degree  $n$ .

9 Let  $R$  be the set of real numbers & let  $f: R \rightarrow R$  be defined by  $f(x) = x^2$ . Is  $f$  invertible?

10. Let  $R = \{(1,2), (3,4), (2,2)\}$  and  $S = \{(4,2), (2,5), (3,1), (1,3)\}$ . Find  $RoS$ ,  $SoR$ ,  $Ro(SoR)$ ,  $(RoS)oR$ ,  $RoR$ ,  $SoS$ ,  $RoRoR$ ,  $SoSoS$

11.) Draw the Hasse diagram for  $X = \{2, 3, 6, 24, 36, 48\}$  and relation  $\leq$  be such that  $x \leq y$ , if  $x$  divides  $y$ .

12 Verify the following relation  $R$  on  $X = \{1, 2, 3, 4\}$  is equivalence relation or not? Explain  $R = \{(1, 1), (1, 4), (4, 1), (2, 2), (2, 3), (3, 4), (3, 3), (3, 2), (4, 3), (4, 4)\}$ .

13.Let  $x = \{1, 2, 3 \dots 7\}$  and  $R = \{(x, y) / x - y \text{ is divisible by } 3\}$   
Show that  $R$  is an equivalence relation.

14.Solve  $X=\{1,2,3\}$  and  $f,g,h$  and  $s$  be functions for  $X$  to  $X$

$$f=\{(1,2),(2,3),(3,1)\}$$

$$g=\{(1,2),(2,1),(3,3)\}$$

$$h=\{(1,1)(2,2),(3,3)\}$$

$$s=\{(1,1)(2,2),(3,3)\} \text{ find fog,gof,fogoh,sog,gos,fov}$$

15.Apply the concept of transitive Closure RelationShip and Solve

Let  $X=\{1,2,3,4\}$  and  $R=\{(1,2),(2,3),(3,4)\}$ be a relation on  $X$ .Find  $R^+$

16.Explain Group And its properties in detail?

17.Explain Semigroup And its properties in detail?

18.Explain Monoid And its Properties in detail?

19.Explain Homomorphism And its properties in detail?

20.Explain Isomorphism And its properties in detail?

Unit-3(level 2 and above)

1. A group of 8 scientists is composed of 5 psychologists and sociologists:

- a) In how many ways can a committee of 5 be formed?
- b) In how many ways can a committee of 5 be formed that has 3 psychologists and 2 sociologists?

2. (a) In how many ways can we draw a heart or spade from ordinary deck of playing cards? a heart or an ace? an ace or a king? A card numbered 2 through 10?

(b) How many ways are there to roll two distinguishable dice to yield a sum that is divisible by 3?

3. (a) In how many different orders can 3 men and 3 women be seated in a row of 6 seats if:

- i. anyone may sit in any of the seats
- ii. the first and last seats must be filled by men
- iii. men and women are seated alternatively

4. How many anagrams (arrangements of letters) are there of

{7.a, 5.c, 1.d, 5.e, 1.g, 1.h, 7.i, 3.m, 9.n, 4.o, 5.t}?

5 How many arrangements are there of 8.a, 6.b, 7.c in which each ‘a’ is on at least one side of another ‘a’.?

6 A chain letter is sent to 10 people in the first week of the year. The next week each person who received a letter sends letters to 10 new people and soon. How many people have received the letters at the end of the year?

7. How many integers between 105 and 106 have no digits other than 2, 5 or 8?

8. In howmany ways can we place 4 red balls, 4 white balls and 4 blue balls in 6 numbered boxes.

9. Howmany integers between 1 and 1,00,000 have the sum of digits equal to 18.

10. In how many different orders can 3 men and 3 women be seated in a row of 6 seats if:

- a) anyone may sit in any of the seats
- b) the first and last seats must be filled by men
- c) men and women are seated alternatively

**II B.TECH I SEM COMPUTER SCIENCE ENGINEERING**  
**PROBABILITY AND STATISTICS**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long answer questions from the half of 3 rd unit)**

**Short Answer Questions 1 M questions      blooms level-1**

1. Define discrete random variable and continuous random variable?
2. Describe the types of random variables?
3. Define the probability distribution function?
4. List two properties of probability function?
5. Define the expectation of discrete random variable?
6. List out the probability distributions?
7. Show that the mean of binomial distribution is  $np$
8. Describe about moment generating function of Poisson distribution?
9. Define the mean and mode of normal distribution?
10. Define moment about origin?
11. Write the recurrence relation of Poisson distribution.
12. Write the formula for Normal distribution function?
13. What is the total probability of Normal curve?
14. Describe the Variance of normal distribution
15. Define the moment generating function Binomial distribution?
16. Find K from the following table

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

17. Show that  $E(X+Y) = E(X) + E(Y)$

18. If  $F(x)$  is the distribution function of random variable  $x$  given by

$$F(x) = \begin{cases} 0 & \text{if } x \leq 1, \\ k(x-1)^4 & \text{if } 1 < x \leq 3, \\ 1 & \text{if } x > 3 \end{cases}$$

Determine  $f(x)$

19. Let  $F(X)$  be the distribution function of random variable  $X$  given by

$$f(x) = \begin{cases} cx^3, & \text{when } 0 \leq x \leq 3 \\ 1, & \text{when } x > 3 \\ 0, & \text{when } x \leq 0 \end{cases}$$

Determine  $c$

20. The mean and variance of binomial distribution are 4 and  $4/3$  respectively.

Find  $p(x>1)$ .

### Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

1. (i) The mean and variance of binomial distribution are 4 and  $4/3$  respectively. Find  $p(x>1)$ .

(ii) Let  $x$  denote the number of heads in a single toss of 4 fair coins. determine (a)  $p(x \leq 2)$  (b)  $p(1 \leq x \leq 3)$

2. Average number of accidents on any duty on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) at most one.

2. Derive the formulae for finding Mean, Median and Mode of a Normal distribution?

3. Derive Mean and Variance of a Poisson distribution?

4. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution?

5. A random variable  $x$  has the following probability distribution.

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

Find the value of

(i) K (ii)  $p(x \leq 2)$  (iii)  $p(2 \leq x \leq 5)$ .

6. Let  $F(X)$  be the distribution function of random variable  $X$  given by

$$f(x) = \begin{cases} cx^3, & \text{when } 0 \leq x \leq 3 \\ 1, & \text{when } x > 3 \\ 0, & \text{when } x \leq 0 \end{cases}$$

Determine (i) c (ii) mean (iii)  $p(x>1)$

7. If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs how many students have masses (i) Greater than 72 kgs  
(ii) Less than or equal to 64kgs (iii) Between 65 and 71 kgs inclusive ?

8. 20% of its items produced from a factory are defective. Find the probability that i) None is defective. ii) One is defective iii)  $P(1 < X < 4)$

9. Given that  $p(x=2)=9p(x=4)+90$   $p(x=46)$  for a Poisson variate X.

Find (i)  $P(x=4)$  (ii).  $p(x \geq 1)$

10. (a) A coin is biased in a way that a head is twice as likely to occur as a tail. If the coin is tossed 3 times, find the probability of getting 2 tails and 1 head  
(b) If X is the continuous random variable whose density function is  $f(x) = x$  if  $0 < x < 1 = (2-x)$  if  $1 \leq x < 2 = 0$ , elsewhere Find  $E(25X^2 + 30X - 5)$

11. If the Mean of a Poisson variable is 1.8, then

find (i)  $p(x > 1)$  (ii)  $p(x=5)$  (iii).  $p(0 < x < 5)$

12. For the discrete probability distribution

X	0	1	2	3	4	5	6
P(X)	0	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Find i)  $k$  ii) mean iii) Variance.

13. The mean and standard deviation of a normal variable are 8 and 4 respectively.

find i)  $p(5 \leq x \leq 10)$  ii)  $p(x \geq 5)$

14.a) If in eight throws of a fair die, getting a 5 or 6 is considered as a success, find the mean and the standard deviation of the successes.

b) The mean and variance of binomial distribution are 4 and  $4/3$  respectively.

Find the probability of occurrence of at most one success.

15. If  $X$  is a normal variate with mean 30 and the standard deviation 5, find the probabilities that (a)  $26 \leq X \leq 40$  (b)  $X \geq 45$ .

16. A random variable  $X$  has density function

$$f(x) = \begin{cases} ce^{-3x} & x > 0 \\ 0 & \text{elsewhere.} \end{cases}$$

Find (a) the constant  $c$  (b)  $P(1 < X < 2)$  (c)  $P(X \geq 3)$ .

17. A random variable  $X$  has density function:  $f(x) = \begin{cases} k(1-x^2) & 0 < x < 1 \\ 0 & \text{elsewhere.} \end{cases}$

Find the value of  $k$  and the probabilities that  $X$  will take on a value

- (a) between 0.1 and 0.2 (b) greater than 0.5.

18. In a normal distribution 31% of the items are under 31% and 8% are over 64.

Find the mean and standard deviation of the distribution.

19. Define probability density function. If a random variable has the probability density function

$$f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & \text{elsewhere,} \end{cases}$$

find the probabilities that it will take on a value

- (a) between 1 and 3 (b) greater than 0.5.

20. Prove that a) Mean of binomial distribution is  $np$

And b) Variance of a binomial distribution is  $np(1-p)$

## UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)

20 questions 1m and 20 questions(2m or 2.5 or 3m)

**Short Answer Questions      1M questions      blooms level-1**

1. Define joint probability mass function?
2. Define joint probability density function?
3. Define marginal probability mass function?
4. Define marginal probability density function?
5. Write the relation between coefficient of correlation and regression coefficient?
6. The two regression equations of the variables  $x$  and  $y$  are  $\textcolor{brown}{x} = 19.13 - 0.87y$  and  $\textcolor{blue}{y} = 11.64 - 0.50x$ . Then find correlation coefficient between  $x$  &  $y$ ?
7. The two regression equations of the variables  $x$  and  $y$  are  $\textcolor{brown}{x} = 20.12 - 0.87y$  and  $\textcolor{blue}{y} = 13.64 - 0.50x$ . Then find mean of  $x$ ?
8. The two regression equations of the variables  $x$  and  $y$  are  $\textcolor{brown}{x} = 13.42 - 0.87y$  and  $\textcolor{blue}{y} = 16.94 - 0.50x$ . Then find mean of  $y$ ?
9. If  $\sum x = 28$ ,  $\sum y = 28$  and  $\sum xy = 112$ . Then find  $COV(x, y)$ ?
10. Define Rank correlation
11. Write the formula for Rank Correlation Coefficient if the ranks are repeated.

12. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from actual mean.
13. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from assumed mean.
14. Write the formula for Regression equation of X on Y.
15. Write the formula for Regression equation of Y on X.
16. Write the formula for regression coefficient of X on Y if the deviations are taken from Assumed Mean.
17. Write the formula for angle between two Regression lines.
18. Write any two properties of Correlation Coefficient.
19. Write any two properties of joint probability density function.
20. Write the formula for Covariance of two random variables if X, Y are continuous random variables.

#### **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Ten participants in a contest are ranked by two judges as follows

X	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient?

2. Psychological tests of intelligence and of engineering ability were applied to 10 students. Hence is a record of ungrouped data showing intelligence ratio (I.R.) and engineering ratio (E.R.) Calculate the coefficient of correlation.

Student	A	B	C	D	E	F	G	H	I	J
I.R.	105	104	102	101	100	99	98	96	93	92
E.R.	101	103	100	98	95	96	104	92	97	94

3. The correlation table given below shows that the ages of husband and wife of 53 married couples living together on the census night of 1991. Calculate the coefficient of correlation between the age of the husband and that of the wife.

Age of husband	Age of wife						Total
	15-25	25-35	35-45	45-55	55-65	65-75	
15-25	1	1	-	-	-	-	2
25-35	2	12	1	-	-	-	15
35-45	-	4	10	1	-	-	15
45-55	-	-	3	6	1	-	10
55-65	-	-	-	2	4	2	8
65-75	-	-	-	-	1	2	3
Total	3	17	14	9	6	4	53

4. In the following table are recorded data showing the test scores made by salesmen on an intelligence test and their weekly sales.

Sales men	1	2	3	4	5	6	7	8	9	10
Test Scores	40	70	50	60	80	50	90	40	60	60
Sales('000)	2.5	6.0	4.5	5.0	4.5	2.0	5.5	3.0	4.5	3.0

Calculate the regression line of sales on test scores and estimate the most probable weekly sales volume if a sales man makes a score of 70?

5. If  $\theta$  is an angle between two regression lines show that  $\tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ . Explain the significance when  $r = 0$  and  $r = \pm 1$ .
6. Find if there is any significant correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

7. Find Karl Pearson's coefficient of correlation from the following data

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

8. A random sample of 5 college students is selected and their grades in Mathematics and Statistics are found to be the following. Find the coefficient of correlation between them

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

9. Find the regression line of x on y for the following data

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

10. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

11. Find if there is any significance correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

12. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

13. Suppose the random variables X, Y have the joint density function defined by

$$f(x, y) = c(2x + y), 2 < x < 6, 0 < y < 5 \text{ and } f(x, y) = 0, \text{Otherwise. Find}$$

$$(i) c \quad (ii) P(x > 3, y > 2)$$

14. From the Following data, Calculate the expected value of Y when X=12

Given  $r=0.99$

	X	Y
Average	7.6	14.8
Standard deviation	3.6	2.5

15. From the following data Calculate (i) correlation coefficient

(ii) Standard Deviation of  $Y(\sigma_y)$ .  $b_{xy} = 0.85$ ,  $b_{yx} = 0.89$ ,  $\sigma_x = 3$

16. If  $\sigma_x = \sigma_y = \sigma$  and the angle between the regression lines is  $\tan^{-1}\left(\frac{4}{3}\right)$  then find  $r$ .

17. If  $r_{12}=0.5$ ,  $r_{31}=0.3$ ,  $r_{23}=0.45$ ,  $r_{31}=0.3$  then find the value of  $R_{3,12}$

18. Given the following data  $r_{12}=0.8$   $r_{13}=0.7$   $r_{23}=0.6$   $\sigma_1=10$   $\sigma_2=8$   $\sigma_3=5$  determine regression of  $X_1$  on  $X_2$  &  $X_3$

19. a single correlation between yield  $x_1$  & temperature  $x_2$  & rainfall  $X_3$  are given by  $r_{12}=0.6$   $r_{23}=0.8$   $r_{31}=0.5$  find the multiple correlation co efficient

20. find the mean values of the variable  $X$  &  $Y$  and correlation coefficient from the following regression line  $3Y-2X-10=0$ ,  $2Y-X-50=0$

**UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)**

ALL BLOOMS LEVEL 2 & 3

### Long Answer Questions

1. (i) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs.487 with a standard deviation Rs.48. with what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 478.6 to 495.4.
2. Sample of size 2 are taken from the population 4,8,12,16,20,24 with out replacement. Find (a) Mean of the population (b) Standard deviation of the population (c) The mean of the sampling distribution of the means (d) the standard deviation of the sampling distributions of means.
3. A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 cm and S.D. 1.61cm?
4. The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5cm?
5. An unbiased coin is thrown  $n$  times. It is desired that the relative frequency of the appearance of heads should lie between 0.49 and 0.51. Find the smallest value of  $n$  that will ensure this result with 90% confidence?

6. A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure. 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure?
7. 11 students were given a test in statistics they were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give evidence that the students have benefited by extra coaching?

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

8. Two horses A and B were tested according to the time in seconds to run a particular race with the following results. Test whether you can discriminate between two horses

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

9. The results of polls conducted 2 weeks and 4 weeks before a election are shown in the following table:

	Two weeks before election	4 weeks before election
For Democratic candidate	84	66
Undecided	37	43
For Republican candidate	79	91

Use the 0.05 level of significance to test whether there has been a change in opinion during the 2 weeks between the rolls.

10. The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1

## **Unit 1**

### **Short answer questions**

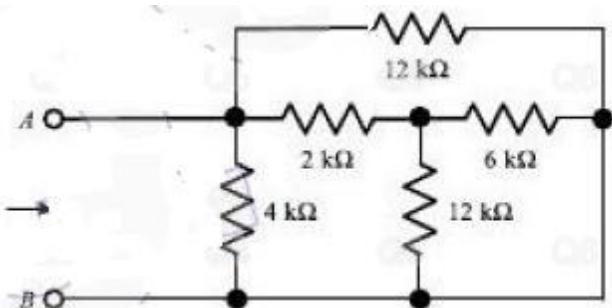
1. State Kirchhoff's voltage law?
2. State Kirchhoff's current law?
3. Explain ideal voltage source?
4. Explain ideal current source?
5. Discuss the applications of both series and parallel combination?
6. Discuss resistor, capacitor, and inductor with relevant expression?
7. Explain the equations for resistors in equivalent delta. If the resistors Ra, Rb and Rc are connected electrically in star?
8. State Ohm's law?
9. State Superposition Theorem?
10. State Thevinins Theorem?
11. State Maximum power transfer theorem?
12. Explain difference between series and parallel resistive circuit ?
13. Mention the limitations of Ohm's Law?

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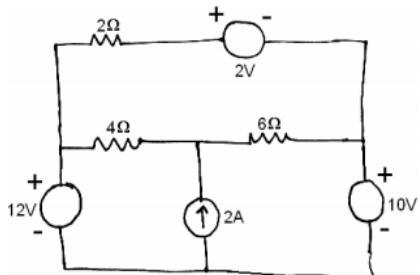
14. Explain source transformations?
15. Give the difference between nodal analysis and mesh analysis?
16. What is a mesh?
17. Define super mesh?
18. Define reference node?
19. Explain with relevant diagram dependent sources?
20. Explain how voltage source with a source resistance can be converted into an equivalent current source?

## Long answer questions

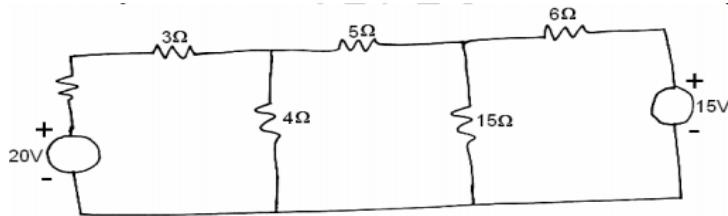
- Find the equivalent resistance for the following circuit?



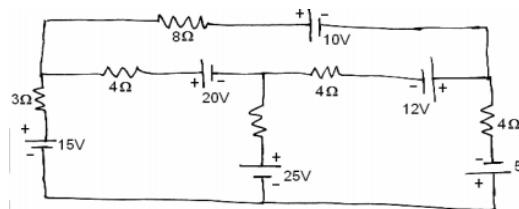
- If current flowing through a coil changes at the rate of  $2\text{amps/sec}$  and the voltage induced is  $20\text{v}$ . Find the inductance value?
- Explain two capacitors are connected in series then  $C_{eq} = (C_1 \cdot C_2) / (C_1 + C_2)$ ?
- Explain derivation of star-delta conversion equations?
- Explain derivation of delta-star conversion equations?
- Explain in detail the volt-ampere relationship of R, L and C elements with neat diagrams?
- Explain about series and parallel networks of resistor?
- Explain about series and parallel networks of inductor?
- Explain classification of network elements?
- Explain superposition theorem?
- Explain Thevinin's theorem?
- Derive the condition for maximum power transfer theorem?
- Use mesh analysis to find currents through the loops in circuit shown. Evaluate power dissipated in  $6\Omega$  resistance.



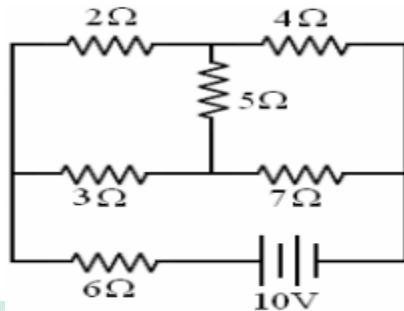
14. Find the power dissipated in the  $15\Omega$  resistance of the network shown. Use nodal analysis.



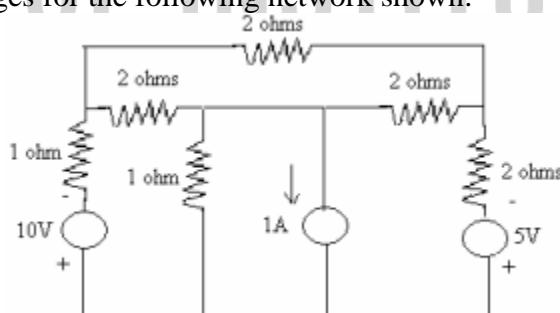
15. Find the power supplied by 15 V source in the circuit shown using mesh analysis.



16. Calculate the current in the  $5\Omega$  resistor using Kirchhoff's laws for the network shown in below figure.



17. Obtain the node voltages for the following network shown.



18. Obtain the equivalent expression

- a) For 4 capacitors in series connected & parallel connected
- b) For 3 inductors in series connected & parallel connected

19. If current flowing through a coil changes at the rate of 5amps/sec and the voltage induced is 30v. Find the inductance value?
20. Explain two inductors are connected in parallel then  $L_{eq} = (L_1 \cdot L_2) / (L_1 + L_2)$ ?



## **Unit 2**

### **Short answer questions**

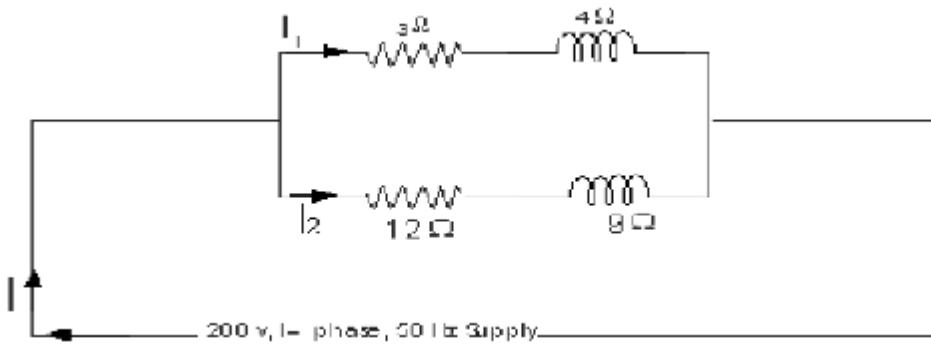
1. Define Impedance?
2. Define admittance?
3. Define susceptance?
4. Define conductance?
5. Define Power factor?
6. Write about series RL circuit?
7. Write about series RC circuit?
8. Explain behavior of RLC Series circuit?
9. Explain about rectangular form
10. Explain about polar form?
11. Explain the significance of J-Operator?
12. Define RMS value?
13. Define average value?
14. Define form factor?

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15. Define peak factor?
16. Discuss what are the advantages of AC quantities?
17. Explain conversion from rectangular form to polar form?
18. Explain conversion from polar form to rectangular form?
19. Define frequency and time period?
20. Define phase and phase difference?

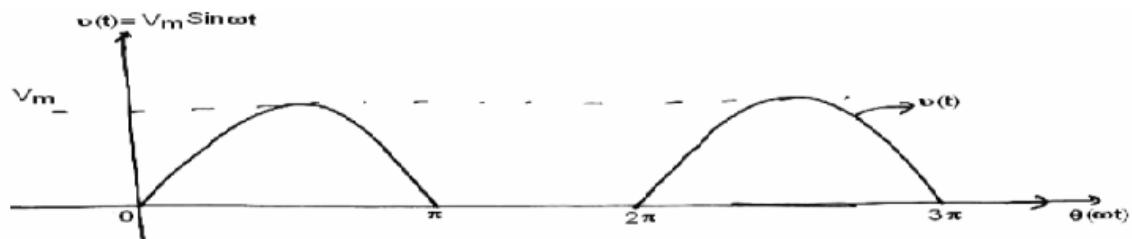
## Long answer questions

1. A circuit consists of a resistance of 15ohm, a capacitance of 200 micro Farad and inductor of 0.05H all in series. If supply of 230V, 50Hz is applied to the ends of circuit. Calculate i) Current in the coil ii) Potential difference across each element?
2. Write about series RC circuit?
3. Solve the following parallel circuit and find out current in each branch and total current as shown in figure

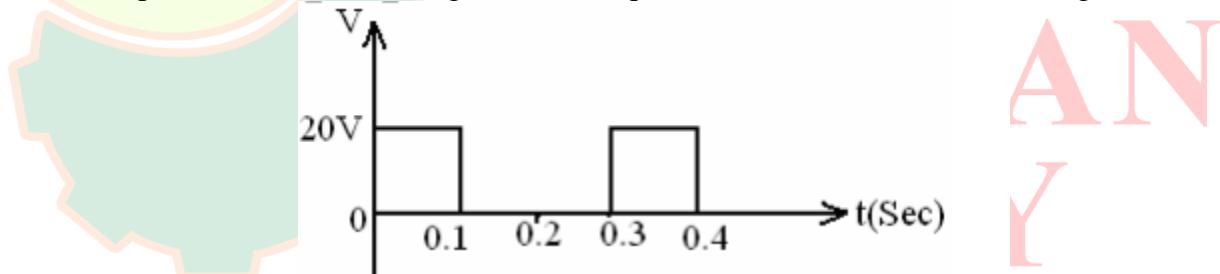


4. Define power factor. What is its Importance in a.c. Circuits?
5. The impedances of a parallel circuit are  $Z_1=(6+j8)\Omega$  and  $Z_2 =(8-j6)\Omega$ . If the applied voltage is 120V, find
  - a. current and power factor of each branch
  - b. overall current and power factor of the circuit
  - c. Power Consumed by each impedance. Draw phasor diagram.
6. A series circuit consisting of a  $10\Omega$  resistor, a  $100\mu F$  capacitor and a  $10 \text{ mH}$  inductor is driven by a 50 Hz a.c. voltage source of maximum value 100 volts. Calculate the equivalent Impedance, current in the circuit, the power factor and power dissipated in the circuit
7. Show that average power consumed by pure inductor and capacitor is zero.
8. A resistance of  $16\text{ohms}$  is connected in series to an inductance of  $20\text{mH}$  and the series combination is connected to an ac supply of  $230\text{V}$ ,  $50\text{Hz}$ . Determine the current through the elements and power delivered by the source, draw the phasor diagram.

9. What is Admittance? Which are its two components? State its unit. How the admittance is expressed in rectangular and polar form?
10. Explain Admittance, Susceptance and Conductance. Draw the admittance triangle
11. Derive the expression for  $i(t)$  for RL series circuit when excited by a sinusoidal source.
12. Calculate the RMS, and average values of an alternating quantity given by  $v = 20 \cos(314t)$ ?
13. Find form factor and peak factor?



14. Compute the RMS and average values of square wave form shown in below figure 3.



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15. Explain & sketch in detail about series RLC circuit?
16. Derive the expression for  $i(t)$  for RC series circuit when excited by a sinusoidal source.
17. Calculate the RMS, and average values of an alternating quantity given by  $v = 10 \cos(314t)$ ?
18. A series circuit consisting of a  $20\Omega$  resistor, a  $10\mu F$  capacitor and a  $100\text{ mH}$  inductor is driven by a  $50\text{ Hz}$  a.c. voltage source of maximum value  $10$  volts. Calculate the equivalent Impedance, current in the circuit, the power factor and power dissipated in the circuit?
19. A circuit consists of a resistance of  $25\text{ ohm}$ , a capacitance of  $20\text{ micro Farad}$  and inductor of  $0.5\text{ H}$  all in series. If supply of  $230\text{ V}$ ,  $50\text{ Hz}$  is applied to the ends of circuit. Calculate i) Current in the coil ii) Potential difference across each element?

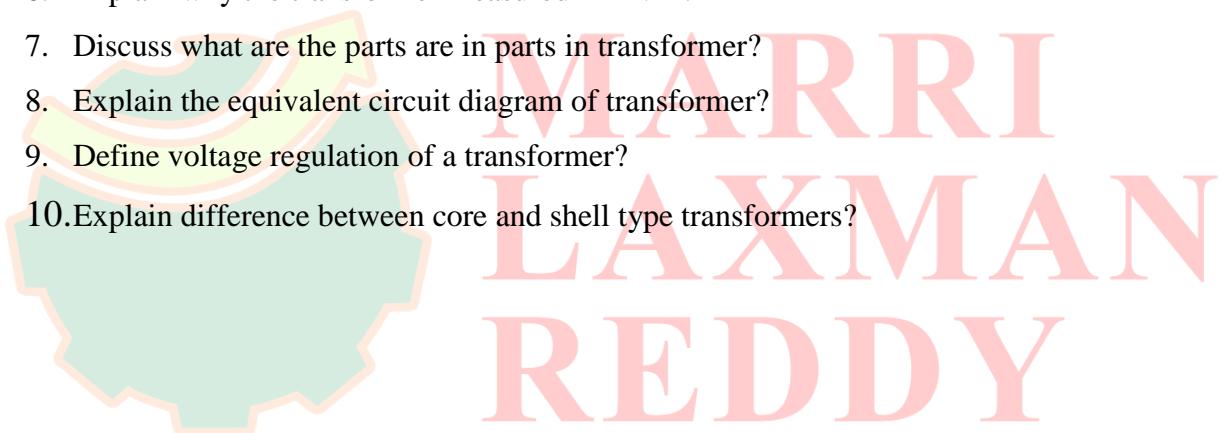
20. A resistance of 6ohms is connected in series to an inductance of 200mH and the series combination is connected to an ac supply of 230V, 50Hz. Determine the current through the elements and power delivered by the source, draw the phasor diagram?



## **Unit 3**

### **Short answer questions**

1. Define transformation ratio?
2. Explain the purpose of laminating the core in a transformer?
3. Explain the emf equation of a transformer and define each term. ?
4. Explain does transformer draw any current when secondary is open? Why?
5. Explain mutual induction principle?
6. Explain why the transformer measured in KVA?
7. Discuss what are the parts are in parts in transformer?
8. Explain the equivalent circuit diagram of transformer?
9. Define voltage regulation of a transformer?
- 10.Explain difference between core and shell type transformers?



## **Long answer questions**

1. Describe the construction details of transformer?
2. Explain the principle of operation of transformer?
3. Explain the OC test of a single phase transformer?
4. Explain the losses in a Transformer?
5. Obtain the condition for maximum efficiency of a transformer?
6. Obtain the equivalent circuit of a single phase transformer?
7. Explain the SC test of a single phase transformer?
8. Explain the determination of deducing equivalent circuit parameters?
9. Explain the ON load condition of a transformer?
- 10.Explain the NO load condition of a transformer?



## **UNIT-1 (Short answer questions)**

1. **Define** an algorithm?
2. **Define** asymptotic notations: big ‘Oh’, omega and theta?
3. **Define** recursive algorithm?
4. **Differentiate** between recursive and iterative algorithms?
5. **Describe** best case, average case and worst case efficiency of an algorithm?
6. **Define** time complexity of an algorithm?
7. **Define** space complexity of an algorithm.
8. **Define** data structure?
9. **Define** ADT?
10. **List** linear and nonlinear data structures?
11. **Define** Linked List?
12. **List** the different types of linked lists?
13. **List** the basic operations carried out in a linked list?
14. **List** the advantages and disadvantages of linked list?
15. **Differentiate** between array and linked list?
16. **Define** Doubly Linked List?
17. **Define** Circularly Linked List?
18. **List** the advantages and disadvantages of doubly linked list?
19. **Define** Circular Linked List?
20. **Define** Sparse Matrix?

## **UNIT-2 (Short answer questions)**

1. **Define** Stack?
2. **List** the applications of stack?
3. **Define** Queue?
4. **List** the applications of queue?
5. **Differentiate** Stack and Queue?
6. **List** out the basic operations that can be performed on a stack ?
7. **List** out the basic operations that can be performed on a queue?
8. **List** the different types of queues?
9. **Define** Circular Queue?
10. **Define** DEQUEUE?
11. **List** the operations that can be performed on DEQUEUE?
12. **State** the different ways of representing expressions?
13. **List** how Stacks and Queues are represented in data structure ?
14. **Discuss** which data structure used in recursion?
15. **Convert** the infix expression  $(a+b)-(c*d)$  into post fix form?
16. **Define** Circular Queue full condition?
17. **Define** Dequeue Overflow condition?
18. **Discuss** in the linked list implementation of the queue class, where does the push member function place the new entry on the linked list?
19. **List** the advantages and disadvantage of Queue?
20. **List** the advantages of circular queue?

## **UNIT-3 (Short answer questions)**

1. **Define** Tree?
2. **List** the applications of Trees?
3. **Define** path in a tree?
4. **Define** Binary Tree?
5. **Define** full binary tree?
6. **Define** complete binary tree?
7. **Define** a right-skewed binary tree and Left-skewed binary tree?

8. **Define** heap?
9. **Define** Priority Queue?
10. **Differentiate** Max-heap and Min-heap?

### **UNIT-1 (long answer questions)**

1. **Discuss** various the asymptotic notations used for best case average case and worst case analysis of algorithms.
2. **Explain** Performance Analysis in Detail.
3. **Define** recursion. Explain with it GCD of two numbers and factorial of a number.
4. **Explain** concatenation of singly linked lists
5. **Explain** circular linked list operations
6. **Explain** doubly linked list operations
7. **List** the advantages and disadvantages of doubly linked list over singly linked list?
8. **Explain** the applications of doubly linked lists
9. **Explain** the following operations in a doubly linked list.
  - a. Insert an element
  - b. Delete an element
  - c. Reverse the list
10. **Explain** time and space complexities in detail
11. **Explain** the different operations on singly liked list
12. **Explain** how to insert a node at particular position in double linked list.
13. **Explain** Array and Linked representation of Sparse Matrix
14. **Write** a C function to insert an element in between two nodes in a double linked list
15. **Explain** how to create circular linked list and insert nodes at end.
16. **Explain** linear and non linear data structures with examples
17. **Given a** single linked list, write a function to swap every two nodes  
e.g 1->2->3->4->5->6 should become 2->1->4->3->6->5
18. **Given a** double linked list, write a function to print alternate nodes.  
e.g 1->2->3->4->5->6 should become 1->3->5
19. **Given a** double linked list, write a function to print list in reverse order.  
e.g 1->2->3->4->5->6 should become 6->5->4->3->2->1.
20. Write a C function to insert at beginning of double linked list.

### **UNIT-2 (long answer questions)**

1. **Write** an algorithm for basic operations on Stack using arrays
2. **Explain** the procedure to evaluate postfix expression
3. **Evaluate** the following postfix expression: 6 2 3 + - 3 8 2 / + \* 2 | 3 +
4. **Explain** the procedure to convert infix expression into postfix expression form.
5. **Write** an algorithm for basic operations on simple Queue using arrays
6. **Write** an algorithm for basic operations on circular queue
7. **Explain** DEQUEUE ADT and its operations
8. **Implement** a queue using two stacks.
9. **Implement** a Circular queue of integer of user specified size and write the functions for enqueue() and dequeue()
10. **Convert** the following expression A + (B \* C) - ((D \* E + F) / G) into post form.
11. **Implement** a stack using two queues.
12. **Write** an algorithm for basic operations on Stack using linked lists
13. **Explain** the operations on simple Queue using linked lists
14. **Write** an algorithm for basic operations on DEQUEUE using arrays
15. **Write** an algorithm for basic operations on DEQUEUE using linked lists
16. **List** the advantages of circular queue over simple queue.
17. **List** the real time applications of stacks and queue.
18. **Convert** the following expression A + (B \* C) - ((D \* E + F) / G) into prefix form.
19. **Write** a C program to read a sequence of characters and print them in reverse order (use

- stack)
20. **Evaluate** the following postfix expression  $5\ 9\ 3\ +\ 4\ 2\ * *\ 7\ + *$  using stack show the content of stack at each step.

### **UNIT-3 (long answer questions)**

1. **Explain** Binary tree ADT.
2. **Explain** tree traversals with example
3. **Explain** different methods of binary tree representation
4. **Explain** how a general tree can be represented as a Binary Tree.
5. **Write** the recursive algorithm to traverse a tree in preorder and explain with example
6. **Write** the recursive algorithm to traverse a tree in Inorder and explain with example
7. **Write** the recursive algorithm to traverse a tree in post order and explain with example
8. **Explain** the properties of binary tree with example.
9. **Discuss** various ways of representation of trees.
10. **Write** the inorder, preorder and postorder of the following expression.

$$A + (B * C) - ((D * E + F) / G)$$

## Unit-I

### **20 short Questions 1M (Blooms level-1)**

1. Define Drift current.
2. Give examples for donor atoms.
3. Give the cut-in voltage for silicon and germanium.
4. Write the diode current equation.
5. Draw the diode equivalent model.
6. Define diode AC resistance.
7. Define PIV.
8. Define form factor.
9. Define rectifier.
10. Draw half wave rectifier circuit.
11. Write the importance of filters.
12. Define ripple factor.
13. Draw the symbols of diode and zener diode.
14. Define TUF.
15. List the applications of diode.
16. Write the equation for efficiency.
17. Draw the NPN transistor symbol.
18. Write the condition for transistor active region.
19. Give the transistor operating modes.
20. Define transistor amplifier.

### **20 Long Questions 2M/2.5M/3M (Blooms level-2&3)**

1. Explain the qualitative theory of PN Junction diode.
2. Determine the conductivity of pure silicon at 300k given,  $n_i=1.65 \times 10^{10} / \text{cm}^3$ .
3. Describe the V-I Characteristics of PN junction diode.

4. Explain about breakdown mechanisms in semiconductor diode.
5. For a germanium semiconductor of the p-type conductivity in  $80\text{mho}/\text{cm}$ . determine the hole concentration, given  $m_p=1800\text{cm}^2/\text{v}\cdot\text{sec}$  and  $n_i=2.5*10^{13}/\text{cm}^3$
6. Describe transition capacitance
7. Explain the principle of operation of tunnel diode.
8. Discuss about zener diode characteristics.
9. Draw and explain the characteristics of varactor diode.
10. Describe static and dynamic resistance levels of diode.
11. Draw and explain the characteristics of silicon controlled rectifier.
12. Discuss about photo diode characteristics.
13. Discuss the effect of temperature on diode V-I characteristics.
14. Distinguish between ideal and practical diodes.
15. Derive the expression for diode equation.
16. Explain the barrier formation of PN junction diode.
17. Distinguish between zener and normal diode.
18. A tunnel diode has  $|dI/dV|_{\text{max}}=1/12\text{mho}$ . a resistor 'R' is connected in parallel with the tunnel diode. It is desired that the combination should not exhibit negative resistance. Determine the value of R.
19. Determine the ratio of forward current  $I_F$  to reverse current  $I_R$  for the same voltage of  $0.07\text{V}$  in both case , at room temperature, in case of a germanium diode.
20. A germanium semiconductor has donor atoms= $2.2*10^{10}/\text{cm}^3$  and acceptor atoms= $3.2*10^{14}/\text{cm}^3$ . $n_i=6.25*10^{26}/\text{cm}^3$ .determine the values of n and p.

## Unit-II

- 1) Draw a circuit diagrams to show two methods of producing a negative output voltage from a half wave rectifies briefly explain.
- 2) Draw the circuit diagram of a bridge rectifies to gather with its input waveforms. Explain the operation of the circuit by identifying the forward biased and reverse biased diodes during each half cycle of the input waveform.
- 3) AHWR circuit has a  $25\text{V(rms)}$  sinusoidal are input and a  $600\Omega$  load resistance calculate the peak output voltage ,peak load current when  $V_f =0.7\text{V}$

- 4) A HWR circuit produces a 55mA peak current in an  $820\Omega$  load resistor calculate the rms ac input voltage and the diode peak reverse voltage if  $V_f = 0.7u$ .
- 5) Compare half wave and full wave rectifier with capacitor fitting, reffering to capacitor for a given ripple amplitude, ripple factor, TUF & % regulation.
- 6) For a rectifier circuit with capacitor filtering, explain ripple voltage and diode peak reverse voltage.
- 7) Explain the function of a transformer in a dc power supply & discuss the factors involved in the specification of power supply transform.
- 8) Draw and explain the circuit diagram of full wave rectifier with L-Section filter.
- 9) Derive the expression for regulation and efficiency of half wave rectifier.
- 10) Draw the circuit of full wave rectifier and derive the expression for
  - a. Dc current
  - b. rms current
  - c. DC load voltage
- 11) Define the following terms with necessary equations.
  - a. Form factor
  - b. peak factor
  - c. efficiency
- 12) Calculate the average value of output voltage, peak diode current and PIV of half wave rectifier. ( $V_s = 12V$  rms and  $R_L = 100$  ohms)
- 13) Design a c-section filter and obtain its expression for ripple factor
- 14) A full wave rectifier has forward resistance of 20 ohms for each diode. A DC volt meter connected accross the load of 1K ohm reads 55.4 volts . Calculate I rms, average voltage, ripple factor and secondary voltage .
- 15) Explain the operation of L-filter .
- 16) Draw the circuit diagram for full wave bridge rectifier and explain its operation.
- 17) Draw the circuit diagram for  $\pi$ -filter and explain its operation.
- 18) Explain the operation of zener voltage regulator.
- 19) Draw the circuit diagram for LC-filter and explain its operation.
- 20) Distinguish between half wave and full rectifiers.

### **Unit-III**

- 1) Draw a neat sketch of an PNP transistor structure and explain the carrier flow when the junctions are unbiased.
- 2) With the help of bias voltages explain the function of pnp transistor.
- 3) Determine  $\alpha_{dc}$  if  $I_E=2.8\text{mA}$  and  $I_B=20\mu\text{A}$  of a BJT. Also calculate the value of  $\beta$  of the transistor.
- 4) Define  $I_{CBo}$  and  $I_{CeO}$  .how they are related?
- 5) Given  $\beta_{dc}=180$  and  $I_c=2.0\text{mA}$ , find  $I_E$  and  $I_B$  and  $I_c$  of BJT.
- 6) Define carrier life time and base width modulation or early effect.
- 7) Derive an expression for collector current  $I_C$  in CB configuration.
- 8) Explain the output characteristics of CE configuration.
- 9) Explain how transistor can be used as a amplifier.
- 10) Explain the input characteristics of CB configuration.

**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**  
**MID I QUESTION BANK**

**Short Answer Questions**

1. Define Tautology
2. Define Statement?
3. Define Contradiction?
4. Define Contingency?
5. Define Converse?
6. Define Inverse?
7. Define contrapositive?
8. Define Duality principle?
9. Define Tautological Implication?
10. Define negation?
11. Define modus ponens rule?
12. Define Disjunctive syllogism?
13. Define predicative logic?
14. Define modus tollence?
15. Define open statement?
16. Define Quantifiers?
17. Define free and bound variables?
18. Define premise?
19. What is consistency?
20. Define CP Rule

**Long Answer Questions**

1. (a) Associate a truth table for each of three (easy) compound statements

i.  $(p \rightarrow q) \wedge (\neg p \rightarrow q)$       ii)  $p \rightarrow (\neg q \vee r)$

2. Explain the negation of the following statements.

- i. Jan will take a job in industry or go to graduate school.
- ii. James will bicycle or run tomorrow.
- iii. If the processor is fast then the printer is slow.

3. (a) Explain the following implication without constructing the truth table.

i.  $(P \rightarrow Q) \rightarrow Q \Rightarrow (P \vee Q)$

ii.  $P \rightarrow Q \Rightarrow P \rightarrow (P \wedge Q)$

4. Explain that the proposition  $P \wedge \neg Q$  and  $(P \vee Q) \wedge (\neg P \wedge \neg Q)$  are contradiction

5. Let p,q and r be the propositions.

- i. P: you have the flee
- ii. q: you miss the final examination.
- iii. r: you pass the course.

Explain the following proposition into statement form.

i.  $P \rightarrow q$

ii.  $\neg p \rightarrow r$

iii.  $q \rightarrow \neg r$

6. Explain the following proposition into statement form.

Let p,q and r be the propositions.

P: you have the flee

q: you miss the final examination.

r: you pass the course

1)  $p \vee q \vee r$

2)  $(p \rightarrow \neg r) \vee (q \rightarrow \neg r)$

3)  $(p \wedge q) \vee (\neg p \wedge r)$

7 Explain the inverse, converse and contra positive of the implication

8. Construct the truth table for the following statement

$$(\neg P \leftrightarrow \neg Q) \leftrightarrow (Q \leftrightarrow R)$$

9.Explain that the following statements are logically equivalent without using truthtable.

$$(P \rightarrow Q) \wedge (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \wedge R)$$

$$10.\text{Show that } (\exists x) (p(x) \wedge Q(x)) \Rightarrow (\exists x) (p(x) \wedge \exists (x) Q(x))$$

11 Construct the truth table for the following statement

$$(\neg P \leftrightarrow \neg Q) \leftrightarrow (Q \leftrightarrow R)$$

12.Explain that the following statements are logically equivalent without using truthtable.

$$(P \rightarrow Q) \wedge (P \rightarrow R) \Leftrightarrow P \rightarrow (Q \wedge R)$$

13.State  $p \rightarrow s$  can be derived from  $\neg p \vee q$ ,  $\neg q \vee r$ ,  $r \rightarrow s$

14.Prove by indirect method that  $\neg q, p \rightarrow q, p \vee r \Rightarrow r$

15.verify the following premises

i)If clifton does not live in france,then he does not speak french

ii)Clifton doesnot drive a Datsun

iii)If clifton lives in france,then he rides a bicycle

iv)Either Clifton speakes French or he drives a datsun

v)Hence Clifton rides a bicycle

16.Change in symbolic form by using Quantifiers

1.All men are good

2.No men are good

3.Some men are good

4.Some men are not good

17Change in symbolic form by using Quantifiers

1.Something is good

2.Everything is good

3.Nothing is good

4.Some thing is not good

18.Obtain DNF of  $\neg(p \vee q) \leftrightarrow (p \wedge q)$

19 $((p \wedge q) \wedge \neg r) \rightarrow ((\neg p \vee \neg q) \wedge r)$

20.Show that  $(svr)$  is tautologically implied by  $(pvq) \wedge (p \rightarrow r) \wedge (q \rightarrow s)$

Unit 2

## Level-1

1. Define binary relation?
2. Define Equivalence Relation ?
3. Define Compatibility Relation?
4. Define Reflexive Relation?
5. Define Transitive Closure?
6. Define Symmetric Relation?
7. Define Anti Symmetric Relation?
8. Define Asymmetric Relation?
9. Define Transitive Relation?
10. Define Compatibility Relation?
11. Define function?
12. Define Bijective function?
13. Define Algebraic Structures?
14. Define Group?
15. Define monoid?
16. Define homomorphism?
17. Define Isomorphism?
18. Define Subgroup?
19. Define inverse Function?
20. Define identity function?

## Unit-2

### level 2 and above

- 1.1. Draw Hasse diagram representing the partial ordering  $\{(A, B) : A \leq B\}$  on the power set  $P(S)$  where  $S = \{a, b, c\}$  where  $\leq$  represents subset relation.
2. Define group. Show that set of integers are group under addition.
3. Show that the function  $f(x, y) = x - y$  is partial recursive.
4. Show that every finite set is primitive recursive.
5. Let  $f: R \rightarrow R$  and  $g: R \rightarrow R$  where  $R$  is set of real numbers. Find  $fog$  and  $gof$  where  $f(x) = x^2 - 2$  and  $g(x) = x + 4$ .
6. Determine whether above functions are injective, surjective and bijective.

7. Let  $\langle S, * \rangle$  be a semi group and  $z \in S$  be a left zero. Show that for any  $x \in S$ ,  $x * z$  is also a left zero.

8. Prove or disprove the following

Every finite group of order  $n$  is isomorphic to a permutation group of degree  $n$ .

9 Let  $R$  be the set of real numbers & let  $f: R \rightarrow R$  be defined by  $f(x) = x^2$ . Is  $f$  invertible?

10. Let  $R = \{(1,2), (3,4), (2,2)\}$  and  $S = \{(4,2), (2,5), (3,1), (1,3)\}$ . Find  $RoS$ ,  $SoR$ ,  $Ro(SoR)$ ,  $(RoS)oR$ ,  $RoR$ ,  $SoS$ ,  $RoRoR$ ,  $SoSoS$

11.) Draw the Hasse diagram for  $X = \{2, 3, 6, 24, 36, 48\}$  and relation  $\leq$  be such that  $x \leq y$ , if  $x$  divides  $y$ .

12 Verify the following relation  $R$  on  $X = \{1, 2, 3, 4\}$  is equivalence relation or not? Explain  $R = \{(1, 1), (1, 4), (4, 1), (2, 2), (2, 3), (3, 4), (3, 3), (3, 2), (4, 3), (4, 4)\}$ .

13.Let  $x = \{1, 2, 3 \dots 7\}$  and  $R = \{(x, y) / x - y \text{ is divisible by } 3\}$   
Show that  $R$  is an equivalence relation.

14.Solve  $X=\{1,2,3\}$  and  $f,g,h$  and  $s$  be functions for  $X$  to  $X$

$$f=\{(1,2),(2,3),(3,1)\}$$

$$g=\{(1,2),(2,1),(3,3)\}$$

$$h=\{(1,1)(2,2),(3,3)\}$$

$$s=\{(1,1)(2,2),(3,3)\} \text{ find fog,gof,fogoh,sog,gos,fov}$$

15.Apply the concept of transitive Closure RelationShip and Solve

Let  $X=\{1,2,3,4\}$  and  $R=\{(1,2),(2,3),(3,4)\}$ be a relation on  $X$ .Find  $R^+$

16.Explain Group And its properties in detail?

17.Explain Semigroup And its properties in detail?

18.Explain Monoid And its Properties in detail?

19.Explain Homomorphism And its properties in detail?

20.Explain Isomorphism And its properties in detail?

Unit-3(level 2 and above)

1. A group of 8 scientists is composed of 5 psychologists and sociologists:

- a) In how many ways can a committee of 5 be formed?
- b) In how many ways can a committee of 5 be formed that has 3 psychologists and 2 sociologists?

2. (a) In how many ways can we draw a heart or spade from ordinary deck of playing cards? a heart or an ace? an ace or a king? A card numbered 2 through 10?

(b) How many ways are there to roll two distinguishable dice to yield a sum that is divisible by 3?

3. (a) In how many different orders can 3 men and 3 women be seated in a row of 6 seats if:

- i. anyone may sit in any of the seats
- ii. the first and last seats must be filled by men
- iii. men and women are seated alternatively

4. How many anagrams (arrangements of letters) are there of

{7.a, 5.c, 1.d, 5.e, 1.g, 1.h, 7.i, 3.m, 9.n, 4.o, 5.t}?

5 How many arrangements are there of 8.a, 6.b, 7.c in which each ‘a’ is on at least one side of another ‘a’.?

6 A chain letter is sent to 10 people in the first week of the year. The next week each person who received a letter sends letters to 10 new people and soon. How many people have received the letters at the end of the year?

7. How many integers between 105 and 106 have no digits other than 2, 5 or 8?

8. In howmany ways can we place 4 red balls, 4 white balls and 4 blue balls in 6 numbered boxes.

9. Howmany integers between 1 and 1,00,000 have the sum of digits equal to 18.

10. In how many different orders can 3 men and 3 women be seated in a row of 6 seats if:

- a) anyone may sit in any of the seats
- b) the first and last seats must be filled by men

c) men and women are seated alternatively

**II B.TECH I SEM COMPUTER SCIENCE ENGINEERING**  
**PROBABILITY AND STATISTICS**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long answer questions from the half of 3 rd unit)**

**Short Answer Questions 1 M questions      blooms level-1**

1. Define discrete random variable and continuous random variable?
2. Describe the types of random variables?
3. Define the probability distribution function?
4. List two properties of probability function?
5. Define the expectation of discrete random variable?
6. List out the probability distributions?
7. Show that the mean of binomial distribution is  $np$
8. Describe about moment generating function of Poisson distribution?
9. Define the mean and mode of normal distribution?
10. Define moment about origin?
11. Write the recurrence relation of Poisson distribution.
12. Write the formula for Normal distribution function?
13. What is the total probability of Normal curve?
14. Describe the Variance of normal distribution
15. Define the moment generating function Binomial distribution?
16. Find K from the following table

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

17. Show that  $E(X+Y) = E(X) + E(Y)$

18. If  $f(x)$  is the distribution function x given by

$$F(x) = \begin{cases} 0 & \text{if } x \leq 1, \\ k(x-1)^4 & \text{if } 1 < x \leq 3, \\ 1 & \text{if } x > 3 \end{cases}$$

Determine  $f(x)$

19. Let  $F(X)$  be the distribution function of random variable X given by

$$f(x) = \begin{cases} cx^3, & \text{when } 0 \leq x \leq 3 \\ 1, & \text{when } x > 3 \\ 0, & \text{when } x \leq 0 \end{cases}$$

Determine c

20. The mean and variance of binomial distribution are 4 and 4/3 respectively.

Find  $p(x>1)$ .

### Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

1. (i) The mean and variance of binomial distribution are 4 and 4/3 respectively. Find  $p(x>1)$ .

(ii) Let x denote the number of heads in a single toss of 4 fair coins. determine (a)  $p(x \leq 2)$  (b)  $p(1 \leq x \leq 3)$

2. Average number of accidents on any duty on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) at most one.

2. Derive the formulae for finding Mean, Median and Mode of a Normal distribution?

3. Derive Mean and Variance of a Poisson distribution?

4. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution?

5. A random variable x has the following probability distribution.

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

Find the value of

$$(i) K \quad (ii) p(x \leq 2) \quad (iii) p(2 \leq x \leq 5).$$

6. Let  $F(X)$  be the distribution function of random variable  $X$  given by

$$f(x) = \begin{cases} cx^3, & \text{when } 0 \leq x \leq 3 \\ 1, & \text{when } x > 3 \\ 0, & \text{when } x \leq 0 \end{cases}$$

Determine (i)  $c$  (ii) mean (iii)  $p(x > 1)$

7. If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs how many students have masses (i) Greater than 72 kgs  
(ii) Less than or equal to 64 kgs (iii) Between 65 and 71 kgs inclusive ?

8. 20% of its items produced from a factory are defective. Find the probability that i) None is defective. ii) One is defective iii)  $P(1 < X < 4)$

9. Given that  $p(x=2)=9p(x=4)+90$   $p(x=46)$  for a Poisson variate  $X$ .

Find (i)  $P(x=4)$  (ii).  $p(x \geq 1)$

10. (a) A coin is biased in a way that a head is twice as likely to occur as a tail. If the coin is tossed 3 times, find the probability of getting 2 tails and 1 head

(b) If  $X$  is the continuous random variable whose density function is  $f(x) = x$  if  $0 < x < 1 = (2-x)$  if  $1 \leq x < 2 = 0$ , else where Find  $E(25X^2 + 30X - 5)$

11. If the Mean of a Poisson variable is 1.8, then

find (i)  $p(x > 1)$  (ii)  $p(x=5)$  (iii).  $p(0 < x < 5)$

12. For the discrete probability distribution

$X$	0	1	2	3	4	5	6
$P(X)$	0	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Find i)  $k$  ii) mean iii) Variance.

13. The mean and standard deviation of a normal variable are 8 and 4 respectively.

find i)  $p(5 \leq x \leq 10)$  ii)  $p(x \geq 5)$

14.a) If in eight throws of a fair die, getting a 5 or 6 is considered as a success, find the mean and the standard deviation of the successes.

b) The mean and variance of binomial distribution are 4 and  $4/3$  respectively.

Find the probability of occurrence of at most one success.

15. If  $X$  is a normal variate with mean 30 and the standard deviation 5, find

the probabilities that (a)  $26 \leq X \leq 40$  (b)  $X \geq 45$ .

16. A random variable  $X$  has density function

$$f(x) = \begin{cases} ce^{-3x} & x > 0 \\ 0 & \text{elsewhere.} \end{cases}$$

Find (a) the constant  $c$  (b)  $P(1 < X < 2)$  (c)  $P(X \geq 3)$ .

17. A random variable  $X$  has density function:  $f(x) = \begin{cases} k(1-x^2) & 0 < x < 1 \\ 0 & \text{elsewhere.} \end{cases}$

Find the value of  $k$  and the probabilities that  $X$  will take on a value

- (a) between 0.1 and 0.2 (b) greater than 0.5.

18. In a normal distribution 31% of the items are under 31% and 8% are over 64.

Find the mean and standard deviation of the distribution.

19. Define probability density function. If a random variable has the probability density function

$$f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & \text{elsewhere,} \end{cases}$$

find the probabilities that it will take on a value

- (a) between 1 and 3 (b) greater than 0.5.

20. Prove that a) Mean of binomial distribution is  $np$

And b) Variance of a binomial distribution is  $np(1-p)$

## UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)

20 questions 1m and 20 questions(2m or 2.5 or 3m)

**Short Answer Questions    1M questions    blooms level-1**

1. Define joint probability mass function?

2. Define joint probability density function?

3. Define marginal probability mass function?

4. Define marginal probability density function?

5. Write the relation between coefficient of correlation and regression coefficient?

6. The two regression equations of the variables  $x$  and  $y$  are  $x = 19.13 - 0.87y$  and  $y = 11.64 - 0.50x$ . Then find correlation coefficient between  $x$  &  $y$ ?

7. The two regression equations of the variables  $x$  and  $y$  are  $x = 20.12 - 0.87y$  and  $y = 13.64 - 0.50x$ . Then find mean of  $x$ ?

8. The two regression equations of the variables  $x$  and  $y$  are  $x = 13.42 - 0.87y$  and  $y = 16.94 - 0.50x$ . Then find mean of  $y$ ?

9. If  $\sum x = 28$ ,  $\sum y = 28$  and  $\sum xy = 112$ . Then find  $Cov(x, y)$ ?

10. Define Rank correlation
11. Write the formula for Rank Correlation Coefficient if the ranks are repeated.
12. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from actual mean.
13. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from assumed mean.
14. Write the formula for Regression equation of X on Y.
15. Write the formula for Regression equation of Y on X.
16. Write the formula for regression coefficient of X on Y if the deviations are taken from Assumed Mean.
17. Write the formula for angle between two Regression lines.
18. Write any two properties of Correlation Coefficient.
19. Write any two properties of joint probability density function.
20. Write the formula for Covariance of two random variables if X, Y are continuous random variables.

### **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Ten participants in a contest are ranked by two judges as follows

X	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient?

2. Psychological tests of intelligence and of engineering ability were applied to 10 students. Hence is a record of ungrouped data showing intelligence ratio (I.R.) and engineering ratio (E.R.) Calculate the coefficient of correlation.

Student	A	B	C	D	E	F	G	H	I	J
I.R.	105	104	102	101	100	99	98	96	93	92
E.R.	101	103	100	98	95	96	104	92	97	94

3. The correlation table given below shows that the ages of husband and wife of 53 married couples living together on the census night of 1991. Calculate the coefficient of correlation between the age of the husband and that of the wife.

Age of husband	Age of wife						Total
	15-25	25-35	35-45	45-55	55-65	65-75	
15-25	1	1	-	-	-	-	2
25-35	2	12	1	-	-	-	15
35-45	-	4	10	1	-	-	15
45-55	-	-	3	6	1	-	10
55-65	-	-	-	2	4	2	8
65-75	-	-	-	-	1	2	3
Total	3	17	14	9	6	4	53

4. In the following table are recorded data showing the test scores made by salesmen on an intelligence test and their weekly sales.

Sales men	1	2	3	4	5	6	7	8	9	10
Test Scores	40	70	50	60	80	50	90	40	60	60
Sales('000)	2.5	6.0	4.5	5.0	4.5	2.0	5.5	3.0	4.5	3.0

Calculate the regression line of sales on test scores and estimate the most probable weekly sales volume if a sales man makes a score of 70?

5. If  $\theta$  is an angle between two regression lines show that  $\tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ . Explain the significance when  $r = 0$  and  $r = \pm 1$ .
6. Find if there is any significant correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

7. Find Karl Pearson's coefficient of correlation from the following data

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

8. A random sample of 5 college students is selected and their grades in Mathematics and Statistics are found to be the following. Find the coefficient of correlation between them

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

9. Find the regression line of x on y for the following data

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

10. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

11. Find if there is any significance correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

12. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

13. Suppose the random variables X, Y have the joint density function defined by

$$f(x, y) = c(2x + y), 2 < x < 6, 0 < y < 5 \text{ and } f(x, y) = 0, \text{Otherwise. Find}$$

$$(i) c \quad (ii) P(x > 3, y > 2)$$

14. From the Following data, Calculate the expected value of Y when X=12

Given  $r=0.99$

	X	Y
Average	7.6	14.8
Standard deviation	3.6	2.5

15. From the following data Calculate (i) correlation coefficient

(ii) Standard Deviation of  $Y(\sigma_y)$ .  $b_{xy} = 0.85$ ,  $b_{yx} = 0.89$ ,  $\sigma_x = 3$

16. If  $\sigma_x = \sigma_y = \sigma$  and the angle between the regression lines is  $\tan^{-1}\left(\frac{4}{3}\right)$  then find  $r$ .

17. If  $r_{12}=0.5$ ,  $r_{31}=0.3$ ,  $r_{23}=0.45$ ,  $r_{31}=0.3$  then find the value of  $R_{3,12}$

18. Given the following data  $r_{12}=0.8$   $r_{13}=0.7$   $r_{23}=0.6$   $\sigma_1=10$   $\sigma_2=8$   $\sigma_3=5$  determine regression of  $X_1$  on  $X_2$  &  $X_3$

19. a single correlation between yield  $x_1$  & temperature  $x_2$  & rainfall  $X_3$  are given by  $r_{12}=0.6$   $r_{23}=0.8$   $r_{31}=0.5$  find the multiple correlation co efficient

20. find the mean values of the variable  $X$  &  $Y$  and correlation coefficient from the following regression line  $3Y-2X-10=0$ ,  $2Y-X-50=0$

**UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)**

ALL BLOOMS LEVEL 2 & 3

### Long Answer Questions

1. (i) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs.487 with a standard deviation Rs.48. with what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 478.6 to 495.4.
2. Sample of size 2 are taken from the population 4,8,12,16,20,24 with out replacement. Find (a) Mean of the population (b) Standard deviation of the population (c) The mean of the sampling distribution of the means (d) the standard deviation of the sampling distributions of means.
3. A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 cm and S.D. 1.61cm?
4. The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5cm?
5. An unbiased coin is thrown  $n$  times. It is desired that the relative frequency of the appearance of heads should lie between 0.49 and 0.51. Find the smallest value of  $n$  that will ensure this result with 90% confidence?

6. A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure. 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure?
7. A 11 students were given a test in statistics they were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give evidence that the students have benefited by extra coaching?

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

8. Two horses A and B were tested according to the time in seconds to run a particular race with the following results. Test whether you can discriminate between two horses

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

9. The results of polls conducted 2 weeks and 4 weeks before a election are shown in the following table:

	Two weeks before election	4 weeks before election
For Democratic candidate	84	66
Undecided	37	43
For Republican candidate	79	91

Use the 0.05 level of significance to test whether there has been a change in opinion during the 2 weeks between the rolls.

10. The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1



**DLD&CO**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m (BLOOMS LEVEL-1) and 10 questions(2m or 2.5 or 3m) OF BLOOMS  
LEVE 2 & 3 from each unit(20+10 from unit 1 and 20+20 from unit 2 Short Answer  
Questions I m questions      blooms level-1**

1. Convert the following numbers with indicated bases to decimal  $(101101)_2, (736.4)_8, (F3)_{16}, (101001.1011)_2$ ?
2. List out the different types of positional and non positional number systems
3. What are complements explain r's complement with examples?
4. Explain the importance and applications of gray code in digital electronics
5. Differentiate binary and BCD codes
6. Explain the process of constructing Boolean expression from truth table?
7. Define logic circuit?
8. List the various types of logic gates?
9. Construct XOR gate logic operation using only NAND Gates
10. Apply Boolean Algebra theorems and postulates to simplify :  $ABC' + ABC + BCD$
11. Find the result of  $10 + (-8)$  apply 2's complement
12. Convert  $111011010$  to equivalent gray code.
13. Convert  $100010101011$  gray code to binary
14. What is a self complementary code?
15. Explain basic logic gates with neat sketch?
16. Construct XOR operation using only NOR gates
17. Discuss Canonical form of Boolean expressions
18. Explain various forms of representing signed numbers?
19. Discuss the IEEE standard for floating point numbers
20. Explain how to convert octal number to decimal number.

## **Long Answer Questions (2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Show how can the following operations be performed using :
  - a. Octal – Hexadecimal conversion
  - b. 111011.011 to decimal conversion
  - c. Binary to BCD form
2. Prove  $\sqrt{41} = 5$
3. Implement XOR with minimum no. of Gates
4. Design a mechanism of detecting overflow in 2's complement addition
5. Draw the logic diagram for XNOR operation
6. Explain all basic gates with logic symbol and truth table
7. What are error detection codes. Explain parity bit with example?
8. Derive logic diagram for odd parity generator and checker?
9. Explain 7 bit Hamming code with example?
10. Discuss the merits and demerits of Hamming code?

## **UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)**

10 questions 1m and 10 questions (2m or 2.5 or 3m)

### **Short Answer Questions      I m questions blooms level-1**

1. What is a K Map? Explain its purpose.
2. Explain how K Map indexing is done?
3. What do you mean by sum of products?
4. Differentiate is the difference between SOP and POS?
5. Simplify  $F=\sum(1, 2, 6, 5)$  using K Map?
6. Discuss how to use don't care conditions in K Map?
7. What is code used to identify each cell in a K Map and why?
8. Why gray code is used to index cells in K Map?
9. State the importance of two level gate implementation?
10. Define Pair, Quad and Octet in K Map

### **Long Answer Questions**

1. Discuss how don't care conditions are useful and when do they come with example.
2. Simplify  $F=\sum(1,2,6,5)$  using K Map?
3. Simplify  $F=\sum(1,2,6,9)$  with don't care conditions at X(11,13,14)

4. Construct a 4X1 multiplexer and discuss its importance
5. What is Shift register? Discuss various types of shift registers
6. How many 4X1 mux are used to construct a 16X1 mux
7. Describe the purpose of Demux with suitable example
8. Explain JK flip flop with neat sketch
9. Draw the logic diagram of master slave flip flop and explain its working principle
10. Explain ring counter in detail

### **Half unit of Unit 3**

#### **Short answer questions**

1. Explain how fixed point addition is carried out in digital computers
2. Explain how multiplication is done in digital computers?
3. Define half adder and discuss how addition of two bits is performed
4. Differentiate half adder and full adder
5. What is n bit binary adder? Draw the logic diagram
6. List any five combinational logic circuits along with their purpose
7. What is code converter
8. What is a magnitude comparator
9. Can we perform both addition and subtraction using single logic circuit?  
Explain
10. Simplify  $F=\sum(1,2)$  and  $\sum(3)$  and draw the logic diagram

#### **Long answer questions**

1. Derive logic for full adder and draw logic diagram
2. Explain multiplication algorithms
3. Explain how division algorithm works with example.
4. What is memory addressing? Explain in detail
5. Calculate the number of address bits needed to identify data in 1GB RAM  
when employed in 32 bit processor

**II B.TECH I SEM ELECTRONICS AND COMMUNICATIONS ENGINEERING**  
**ELECTRICAL CIRCUITS**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

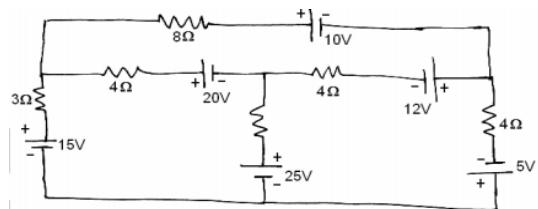
**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS  
LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long  
answer questions from the half of 3 rd unit)**

**Short Answer Questions I m questions      blooms level-1**

1. State Kirchhoff's laws?
2. Sketch the relevant diagram for different types of dependent sources?
3. Define ideal voltage and current source?
4. Give two applications of both series and parallel combination?
5. Explain and voltage and current division rule?
6. Give the difference between nodal and mesh analysis?
7. Define super mesh?
8. Define reference node?
9. Define current division rule?
10. Explain how voltage source with a source resistance can be converted into an equivalent current source?
11. Define Passive & Active elements, Voltage, Current and Power?
12. Write the definitions of Resistor, Inductor & Capacitor & derive the voltage, current & energy relations.
13. Derive the expression for energy stored in inductor and capacitor?
14. Calculate the equivalent capacitance when the capacitances are connected in parallel?
15. Which network combination voltage acts as reference?
16. What is the law of conservation of charge?
17. What is the current supplied when two resistances of 5ohm and 20ohm are connected in parallel. The parallel combination is connected in series with a 10hm resistance and this series parallel combination is connected across a dc source of 100V.
18. What is the number of independent mesh equations required to solve the network in a network if the number of nodes is N and the number of branches is B.
19. State and explain ohm's law?
20. Define Voltage division rule?

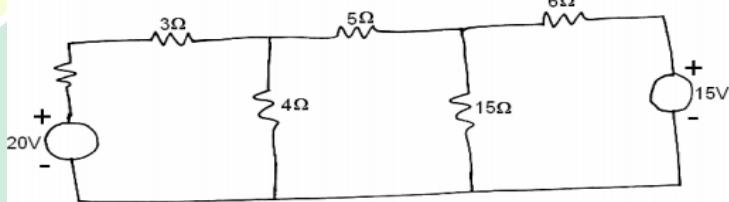
**Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVEL 2 & 3**

- Derive the expressions for equivalent star connection when 3 resistances  $R_{ab}$ ,  $R_{bc}$  and  $R_{ca}$  are connected in delta connection?
- Explain in detail volt-ampere relation of capacitor C with step and saw tooth inputs
- Find the power supplied by 15 V source in the circuit shown in Fig.1 using mesh analysis.



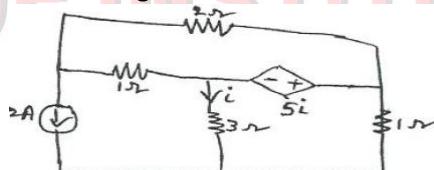
**Figure.1**

- Explain the nodal analysis with one example?
- Find the power dissipated in the  $15\Omega$  resistance of the network in Fig.2. Use nodal analysis.



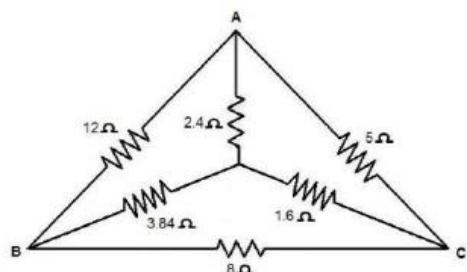
**Figure.2**

- Using mesh analysis, find the magnitude of the current dependent source and current through the  $2\Omega$  resistor as shown in figure 3



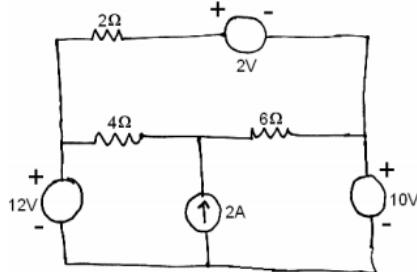
**Figure.3**

- Determine the equivalent resistance across AB of the circuit shown in fig.4



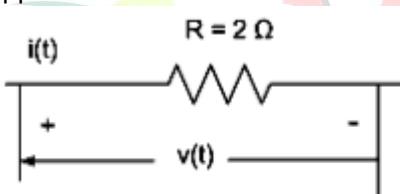
**Figure.4**

8. A series circuit with  $R = 2$  ohms,  $L = 2$  mH, and  $C = 500$  micro-farads has a current which increases linearly from zero to  $10$  A in the interval  $0 \leq t \leq 1$  ms, remains at  $10$  A for  $1 \text{ ms} \leq t \leq 2$  ms, and decreases linearly from  $10$  A at  $t = 2$  ms to zero at  $t = 3$  ms. Sketch  $V_R, V_L, V_C$
9. Explain different source transformation techniques
10. Use mesh analysis to find currents through the loops in Fig.5 Evaluate power dissipated in  $6\Omega$  resistance.

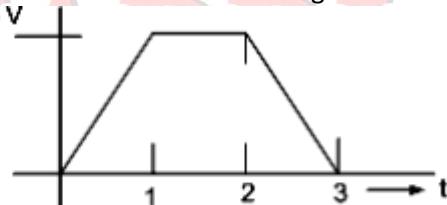


**Figure.5**

11. Consider the resistance shown below Figure (a). A voltage  $v(t)$  of waveform given in Figure (b) is applied at its terminals. Obtain the waveform of current through it.

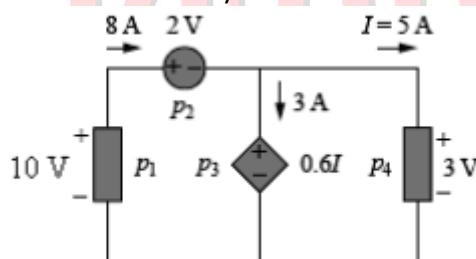


**Figure (a)**



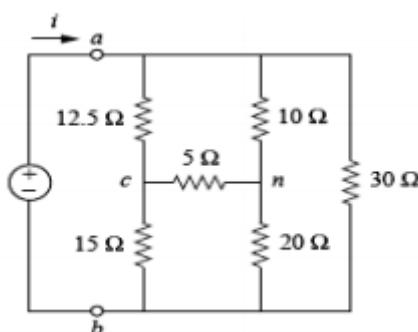
**Figure (b)**

12. Calculate the power supplied or absorbed by each element as shown in below Figure.6.



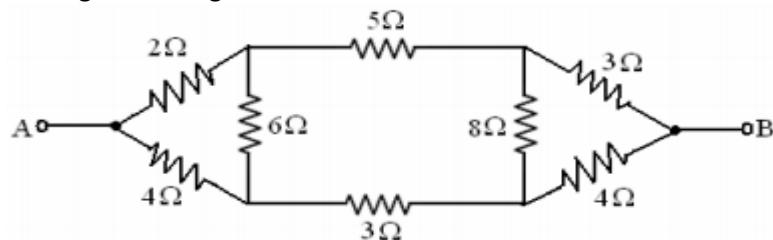
**Figure.6**

13. Obtain the equivalent resistance  $R_{ab}$  for the circuit shown in below Figure.7. Find the current  $i$  for the input voltage of  $140$  V and calculate the current in all the elements of the circuit.



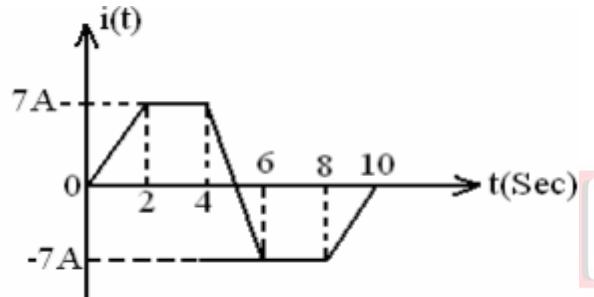
**Figure.7**

- 14.** Find the voltage to be applied across 'A-B' in order to drive a current of 10 A into the circuit as shown in below figure 8 using star-delta transformation.



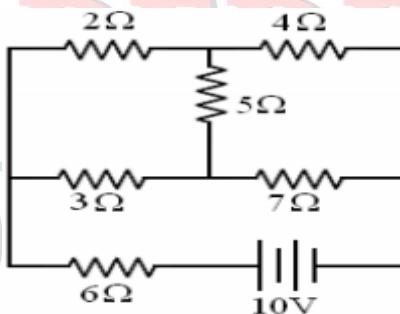
**Figure.8**

- 15.** The current waveform for the pure inductance of 3m H is shown in below figure 9. Draw the voltage and power wave forms.



**Figure.9**

- 16.** Calculate the current in the  $5\Omega$  resistor using Kirchhoff's laws for the network shown in below figure 10.

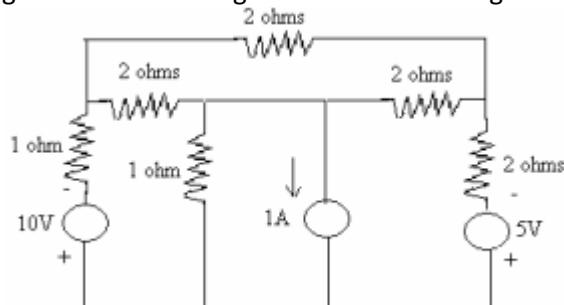


**Figure.10**

- 17.** Distinguish between ideal and practical sources and draw their characteristics.

- 18.** Explain the super mesh analysis with one example?

- 19.** Obtain the node voltages for the following network shown in figure.11



**Figure.11**

- 20.** Obtain the equivalent expression
- For 4 capacitors in series connected & parallel connected
  - For 3 inductors in series connected & parallel connected

## **UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)**

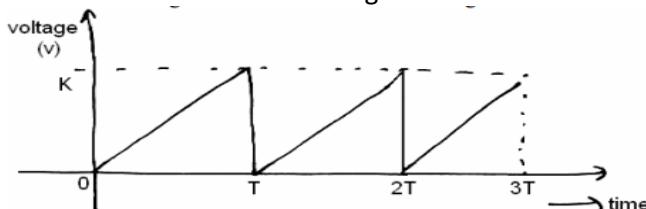
20 questions 1m and 20 questions(2m or 2.5 or 3m)

### **Short Answer Questions I m questions blooms level-1**

- What is complex power?
- Define i) admittance ii) reactance
- Define the terms i) impedance triangle ii) power triangle.
- Define the terms i)Impedance ii) Susceptance
- Calculate RMS value for  $v(t)=10+200 \sin(\omega t-30^\circ)+100 \cos 3\omega t-50\sin (\omega t+60^\circ)$
- State the advantages of sinusoidal alternating quantity.
- Derive the expression for RMS value of alternating current wave  $I=I_m \sin(\omega t)$
- Define i) power factor ii) apparent power.
- Define R.M.S value.
- Define peak factor and form factor?
- Define i) True factor ii) reactive power
- Draw the phasor diagrams for pure R,L and C
- Sketch the phasor diagrams for series RLC
- Sketch the phasor diagrams for parallel RLC
- Calculate frequency and rms current for the expression  $i(t)=14.14 \sin 314t$
- What is the significance of power factor
- Calculate inductance value of  $20 \angle 60^\circ$ . Assume frequency is 60 Hz
- Calculate the source voltage and phase angle if voltage across the resistance is 70V and voltage across the inductive reactance is 20V
- Define j-operator?
- Give the individual impedance relations with R,L and C

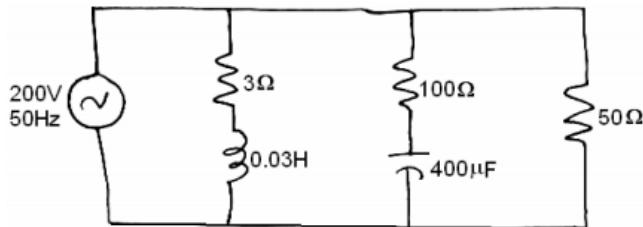
### **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

- A coil takes a current of 1A at 0.6 lagging power factor from a 220 V, 60 Hz single phase source. If the coil is modeled by a series RL circuit find (i) Complex power in the coil (ii) find the values of R and L
- Find the form factor of the wave form shown in Fig.1.



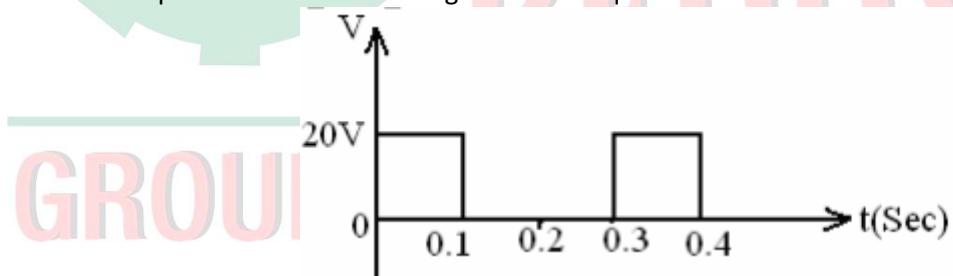
**Figure.1**

- Find the complex power for the entire circuit of Fig.2. Draw the power triangle.



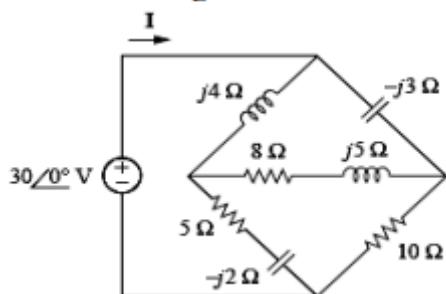
**Figure.2**

4. A circuit consists of a resistance of  $15\Omega$ , a capacitance of  $200\mu F$  and inductor of  $0.05H$  all in series. If supply of  $230V$ ,  $50Hz$  is applied to the ends of circuit. Calculate
  - i) Current in the coil ii) Potential difference across each element iii) Frequency at which current would have unity power factor.
5. Illustrate following terms: i) Impedance ii) Phase difference iii) phasor diagram iv) Power factor for parallel RC network
6. Find the form factor of the given trapezium waveform of period  $\pi$  with  $2V$  input
7. A series circuit has  $R=10\Omega$ ,  $L=50mH$ , and  $C=100\mu F$  and is supplied with  $200V, 50Hz$ . Find (i) Impedance (ii) current (iii) power (iv) power factor (v) voltage drop across the each element.
8. Explain & sketch in detail about series RLC circuit
9. A coil takes a current of  $1A$  at  $0.6$  lagging power factor from a  $220 V$ ,  $60 Hz$  single phase source. If the coil is modeled by a series RL circuit find (i)Complex power in the coil ii) The values of  $R$  and  $L$
10. Calculate Current in the Coil of a circuit consists of a resistance of  $15 \Omega$ , a capacitance of  $200 \mu F$  and inductor of  $0.05 H$  all in series .If supply of  $230 V$ ,  $50Hz$  is applied to the ends of circuit.
11. Compute the RMS and average values of square wave form shown in below figure 3.



**Figure 3**

12. Find  $I$  in the circuit shown in below Figure.4



**Figure.4**

13. For the parallel circuit shown in below Figure.5 has the parameter value as:  $R_1 = 100$  ohms (non inductive); coil  $R_c = 40$  ohms,  $L_c = 0.52$  H,  $R_2 = 120$  ohms; and  $X_c = 158$  ohms (at 50 Hz). i) Determine the branch currents and the total current ii) Draw the phasor diagram indicating the currents and voltages across the coil and capacitor

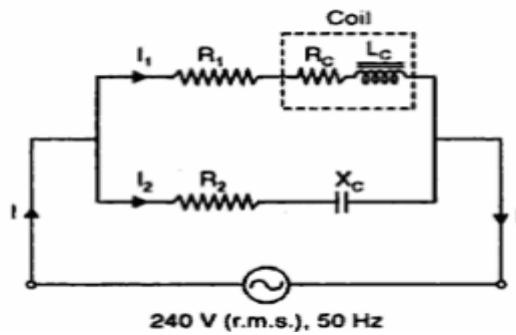


Figure.5

14. In the circuit shown below Figure.6, the first branch takes a leading current ( $I_1$ ) of 15A and has a resistance of  $5\Omega$ , while the second branch takes a lagging current ( $I_2$ ) at a p.f. of 0.8. The total power supplied is 5 kW. Determine the impedances and circuit parameters

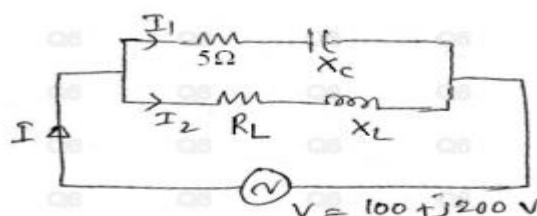


Figure.6

15. Explain & sketch in detail about parallel RLC circuit  
 16. A circuit consisting of three branches,  $Z_2$  is in parallel with  $Z_3$  the combination is in series with  $Z_1$  having the values  $Z_1=10+j30$ ,  $Z_2 = 5+j10$  and  $Z_3 = 4-j16$  connected across single phase, 100 V, 50 Hz supply. Find i)  $I_1$ ,  $I_2$  and  $I_3$  ii)  $V_1$  and  $V_2$   
 17. Find form factor of a non alternating periodic waveform shown in figure 7.

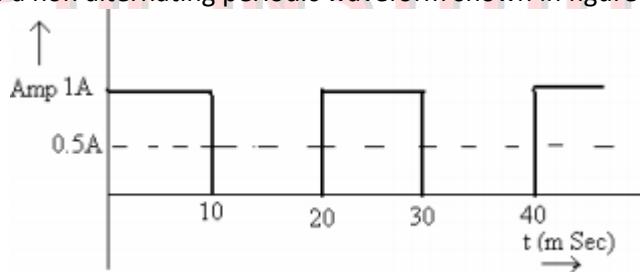


Figure.7

18. Show that power dissipated by a pure capacitor excited by a sinusoidal voltage source  $V = V_m \sin \omega t$  is zero.  
 19. Explain in detail i) complex power ii) power triangle  
 20. A parallel circuit having two branches, first branch consisting of 3 ohms resistor is in series with 12.7 mH inductor, second branch consisting of 1 ohm resistor in series with 3.18 mH is connected across 200 V, single phase, 50 Hz supply. Calculate: a) Conductance and

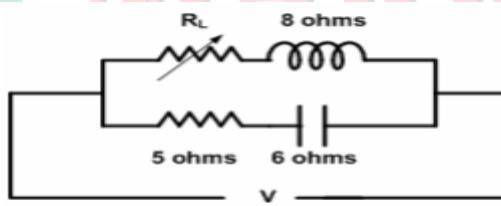
susceptance of each branch b) The resultant admittance c) The current in each branch d) Total current input

### **UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)**

ALL BLOOMS LEVEL 2 & 3

#### **Long Answer Questions**

1. Explain procedure to draw the locus diagram of R-L series circuit when L is varying
2. A voltage  $V = 50\angle 0^\circ$  V is applied to a series circuit consisting of fixed inductive reactance,  $X = 5$  ohms and a variable resistance R. Sketch the admittance
3. Derive the expression for half power frequencies for a RLC series circuit?
4. Obtain the current locus of a fixed resistance and a variable capacitance
5. A voltage of  $V = 50\angle 0^\circ$  V is applied to a series circuit of fixed resistance  $R = 5$  ohms and a variable capacitance C. Sketch the admittance and current locus diagrams
6. Explain procedure to draw the locus diagram of R-C series circuit when R is varying
7. Draw the locus diagram and obtain the value of RL in the circuit shown in below Figure.1 which results in resonance for the circuit.



**Figure.1**

8. Explain the procedure to draw the locus diagram of R<sub>L</sub>-L series in parallel with R with R<sub>L</sub> is variable
9. A non inductive resistance R, variable between 0 and 12 ohms, is connected in series with a coil of resistance of 4 ohms and reactance of 5 ohms the circuit supplied from a 230 V a.c supply. By means of a locus diagram, determine the current supplied to the circuit when R is 0, 6 and 12 ohms.
10. Explain the procedure to draw the locus diagram of R<sub>L</sub>-C series in parallel with R with L is variable

**II B.TECH I SEM ELECTRONICS AND COMMUNICATIONS ENGINEERING**  
**ELECTRONIC DEVICES AND CIRCUITS**  
**MID I QUESTION BANK**

**UNIT-1**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS  
LEVEL 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long  
answer questions from the half of 3 rd unit)**

**Short Answer Questions 1m questions blooms level-1**

1. What is an ideal diode?
2. Compare ideal diode as a switch.
3. State the mathematical equation which relates voltage applied across the PN junction diode and current flowing through it.
4. Define knee/cut-in/threshold voltage of a PN diode.
5. What is the effect of junction temperature on cut-in voltage of a PN diode?
6. What is the effect of junction temperature on forward current and reverse current of a PN diode?
7. List the PN diode parameters.
8. State the PN diode ratings.

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9. Define drift current?
10. Define diffusion current?
11. Define reverse recovery time.
12. List the PN diode switching times.
13. Define transition capacitance of a diode.
14. Define diffusion capacitance of a diode.
15. List some applications of zener diode.
16. State the ratings of zener diode.
17. Define contact potential in metal semiconductor contact.
18. What is zener breakdown?
19. What is avalanche break down?
20. What is tunneling phenomenon?

## **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Illustrate V-I characteristics of an ideal diode.
2. Differentiate between drift and diffusion currents.
3. Why Si is preferred over Ge in the manufacture of semiconductor devices?
4. Explain the terms knee voltage & break down voltage with respect to diodes?
5. Illustrate V-I characteristics of a Practical diode.
6. Differentiate avalanche and zener breakdowns.
7. Illustrate V -I characteristics of a zener diode.
8. Give the application of tunnel diode.
9. Give the advantages and disadvantages of tunnel diode.
10. Illustrate equivalent circuit of tunnel diode.
11. Explain about the ohmic contact of metal semiconductor junction.
12. Explain the operation of zener diode and how it is used as a voltage regulator.
13. Explain the operation of varactor diode.
14. With neat diagram explain about varactor diode.
15. Explain the operation of PN junction under forward bias condition with its characteristics.
16. Explain the operation of PN junction under reverse bias condition with its characteristics.
17. Explain details about the switching characteristics on PN diode with neat Sketch.
18. Derive diode current equation.
19. Explain load line analysis.
20. Illustrate the equivalent circuit of ideal and practical diode.

## **UNIT-2**

20 questions 1m and 20 questions(2m or 2.5 or 3m)

### **Short Answer Questions 1m questions blooms level-1**

1. Define rectifier.
2. Define rectifier efficiency.
3. Define ripple factor of a rectifier.
4. Define TUF of a rectifier.
5. What is C filter?
6. What is the need for a filter in rectifier?
7. List the different types of filters.

8. What is the ripple factor of HWR and FWR?
9. What is the maximum rectification efficiency of FWR?
10. What is choke filter?
11. List some advantages and disadvantages of CLC filters.
12. What is the need for voltage regulators?
13. What are the drawbacks of unregulated power supply?
14. What is voltage regulator? List some types.
15. Define Voltage regulation.
16. Define Minimum load resistance.
17. Define peak inverse voltage.
18. What are the advantages and disadvantages of half wave rectifier?
19. What are the advantages and disadvantages of Center tapped full wave rectifier?
20. What are the advantages and disadvantages of full wave Bridge rectifier?
- 21.

### Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

- 1) Draw the block diagram of RPS. What are the important characteristics of a Rectifier circuit?
- 2) Draw the circuit diagram of a HWR.
- 3) Explain HWR operation with waveforms.
- 4) Draw the circuit diagram of a FWR, a) With centre tap connection and b) Bridge connection and explain its operation.
- 5) Define the terms as referred to FWR circuit. (i) PIV (ii) Average DC voltage (iii) RMS current  
(iv) Ripple factor
- 6) Explain why bridge rectifier is preferred over center tapped FWR.
- 7) Derive the expression for the ripple factor of HWR and FWR
- 8) Compare Rectifier circuits.
- 9) Explain the principle of operation of HWR with and without capacitor input filter and the waveforms.
- 10) Obtain the expression for ripple factor in the case of Full Wave Rectifier Circuit with Capacitor Filter.

- 11) Explain the terms Swinging Choke and Bleeder Resistor.
- 12) Draw the circuit diagram of FWR with inductor filter and explain its operation.
- 13) Draw the circuit diagram of HWR with capacitor filter and explain its operation.
- 14) Show that ripple factor of full wave rectifier is 0.482.
- 15) Compare all the filter circuits from the point of view of ripple factor.
- 16) Derive the expression for ripple factor for FWR with L-section filter.
- 17) Explain the necessity of a bleeder resistor.
- 18) Derive the ripple factor of  $\lambda$ -filter with neat sketch. (or) Discuss a FWR with  $\lambda$ -filter.
- 19) why do we need filters in a power supply, under what condition we shall prefer a capacitor filter?
- 20) What is the PIV in Center tapped and bridge FWR?

UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)

ALL BLOOMS LEVEL 2 & 3

#### Long Answer Questions

- 1) Define a Transistor. Why transistor is considered as current control device? Explain
- 2) With neat diagrams explain the working of npn and pnp transistor.
- 3) What are the different configurations of BJT? Explain.
- 4) With necessary diagram explain the input and output characteristics of CB configuration.
- 5) Explain the input and output characteristics of a transistor in CB configuration.
- 6) Draw the circuit diagram of a NPN transistor CE configuration and the input and output characteristics. Also define its operating regions.
- 7) Explain the input and output characteristics of a transistor in CC configuration.
- 8) Give the comparison of CE,CB,CC configuration.
- 9) Write short notes on emitter efficiency, Transport factor and large signal current gain.
- 10) Give the relationship between  $\alpha$ ,  $\beta$  and  $\gamma$  of a transistor.

**II B.TECH I SEM ELECTRONICS AND COMMUNICATIONS ENGINEERING  
MATHEMATICS-III  
MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS  
LEVEL 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long  
answer questions from the half of 3rd unit)**

**Short Answer Questions 1 m questions      blooms level-1**

1. Define Cauchy's homogeneous linear equation.?
2. What are the basis of solution are for the differential equation

$$x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = 0 ?$$

3. Define Lagranges homogeneous linear equation.?
4. What are the basis of solution are for the differential equation

$$x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = 0 ?$$

5. What are the basis of solution are for the differential equation

$$x^3 \frac{d^3 y}{dx^3} + 3x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 0 ?$$

6. Define power series solution of differential equation about the point  $x=0$ ?
7. Explain the Frobenius method?
8. List the various types of solution for Frobenius method?
9. Define analytic function?
10. Define Ordinary point?
11. Define Singular point?
12. Define regular Singular point?
13. Define Irregular Singular point?
14. Explain the particular integral of  $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = \log x$ ?

15. Explain the complimentary function of  $x^2 \frac{d^2 y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$  ?
16. Discuss the solution of differential equation  $x^2 \frac{d^2 y}{dx^2} + x \frac{dy}{dx} = 0$  ?
17. Discuss the ordinary point of differential equation  $(1+x^2) \frac{d^2 y}{dx^2} + x \frac{dy}{dx} - y = 0$  ?
18. Discuss the regular Singular point of differential equation  
 $2x^2 \frac{d^2 y}{dx^2} + 3x \frac{dy}{dx} (x^2 - 4)y = 0$  ?
19. Explain the required solution to transform into a linear differential equation with constant coefficient  $(1+x^2) \frac{d^2 y}{dx^2} + (1+x) \frac{dy}{dx} + y = 2 \sin \log(1+x)$  ?
20. Explain the required solution to transform into a linear differential equation with constant coefficient  $x \frac{d^2 y}{dx^2} + \frac{dy}{dx} = \frac{12 \log x}{x}$  ?

**Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Solve the differential equation  $((x^2 D^2 - 3xD + 1)y = \log x(\sin(\log x + 1))/x)$

2. Obtain the series solution of the equation  $x(1-x) \frac{d^2 y}{dx^2} - (1+3x) \frac{dy}{dx} - y = 0$ .

3. Solve  $y^{11} - xy^1 + y = 0$  in power series

4. Find the singular point of the following differential equation

$$x^3(x-1) \frac{d^2 y}{dx^2} + 2(x-1) + y = 0$$

5. Solve the differential equation  $(x^2 D^2 - 4xD + 6)y = x^2$

6. Solve the differential equation  $x^3 \frac{d^3 y}{dx^3} + 2x^2 \frac{d^2 y}{dx^2} + 2y = 10(x + \frac{1}{x})$ .

7. Solve the differential equation  $(x^2 D^2 - 4xD + 6)y = (\log x)^2$

8. Solve the differential equation  $(x^2 D^2 - 3xD + !)y = \frac{\log x \sin(\log x) + 1}{x}$

9. Solve the differential equation  $(x+1)^2 D^2 - 3(x+1)D + 4)y = x^2 + x + 1$ .

10. Solve the differential equation  $(2x-1)^3 D^3 + (2x-1)D - 2)y = x$ .

11. Solve the differential equation  $(x+a)^2 D^2 - 4(x+a)D + 6)y = x$ .

12. Solve the differential equation  $(x+1)^2 D^2 + (x+1)D)y = (2x+3)(2x+4)$ .

13. Solve in series the differential equation  $\frac{d^2y}{dx^2} - xy = 0$ .
14. Solve in series differential equation  $.y'' + \frac{dy'}{dx} + y = 0$
15. Solve in series differential equation  $.y'' + (x-3)y' + y = 0$  in power of  $(x-2)$ .
16. Solve in series differential equation  $.4xy'' + 2y' + y = 0$ .
17. Solve in series differential equation  $.4x(1-x)y'' - 12y' + 4y = 0$ .
18. Solve in series differential equation  $.xy'' + y' + xy = 0$ .
19. Solve in series differential equation  $.x(1-x)y'' - 3xy' - y = 0$ .
20. Solve in series differential equation  $.2x^2y'' + xy' - (x+1)y = 0$ .

#### UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)

20 questions 1m and 20 questions(2m or 2.5 or 3m)

**Short Answer Questions      I m questions blooms level-1**

1.

1. Define the Legendre equation?
2. Define the generating function for  $p_n(x)$ ?
3. Define the Rodrigues formula for  $p_n(x)$ ?
4. What is the value of  $p_1(x)$ ?
5. What is the value of  $p_2(x)$ ?
6. What is the value of  $p_4(x)$ ?
7. Define orthogonality relation for Legendre polynomials?
8. What is the value of  $p_n(1)$ ?
9. What is the value of  $P_{2n+1}(0)$ ?
10. Express  $2x^2+x+3$  in terms of Legendre polynomials?
11. Define the Bessel's equation?
12. Define the generating function for  $J_n(x)$ ?
13. What is the value of  $J_1(x)$ ?
14. What is the value of  $J_0(x)$ ?
15. Define orthogonality relation for Legendre polynomials?

16. Define the Beltrami's result ?
17. What is the value of  $J_0^2 + 2(J_1^2 + J_2^2 + \dots)$ ?
18. Explain Jacobi series?
19. What is the value of  $J_{-1/2}(x)$ ?
20. What is the value  $x^2$  in terms of Legendre polynomial?
21. What is the value  $x^3$  in terms of Legendre polynomial?

### Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

- 1) Show that  $J_0''(x) = \frac{1}{2} [J_2(x) - 2J_0(x)]$
- 2) Show that  $\frac{d}{dx} (J_n^2 + J_{n+1}^2) = 2 \left( \frac{n}{x} J_n^2 - \frac{(n+1)}{x} J_{n+1}^2 \right)$
- 3) Prove that  $\frac{d}{dx} (x^n J_n(x)) = x^n (J_{n-1}(x))$
- 4) Prove that  $J_n'(x) + \frac{n}{x} J_n(x) = J_{n-1}(x)$
- 5) Prove that  $2J_n'(x) = J_{n-1}(x) - J_{n+1}(x)$
- 6) Prove that  $\frac{2n}{x} J_n(x) = J_{n-1}(x) + J_{n+1}(x)$
- 7) Show that  $P_n(-x) = (-1)^n P_n(x)$  and  $P_n'(-x) = (-1)^{n+1} P_n'(x)$
- 8) Prove that  $(2n+1)(1-x^2) P_n'(x) = n(n+1)[P_{n-1}(x) - P_{n+1}(x)]$
- 9) Express the polynomial  $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$  in terms of Legendre polynomials
- 10) Prove that  $P_{2n+1}(0) = 0$ ;  $P_{2n}(0) = \frac{(-1)^n (2n)!}{2^{2n} (n!)^2}$
- 11) Show that  $\int_{-1}^1 x^2 P_{n-1}(x) P_{n+1}(x) dx = \frac{2n(n+1)}{(2n-1)(2n+1)(2n+3)}$
- 12) Show that  $\int_{-1}^1 P_n(x) dx = 0 \quad \text{if } n \neq 0$
- 13) Show that  $\int_{-1}^1 x P_n(x) P_{n-1}(x) dx = \frac{2}{4n^2 - 1}$
- 14) Prove that  $(2n+1)xP_n(x) = (n+1)P_n(x) + nP_{n-1}(x)$

- 15) Prove that  $(2n+1)P_n(x)=P_{n+1}^1(x)-P_{n-1}^1(x)$
- 16) Prove that  $(1-x^2)P_n^1(x)=(n+1)[xP_n(x)-P_{n+1}(x)]$
- 17) Prove that  $J_{1/2}(x)=\sqrt{\frac{2}{\pi x}} \sin x$
- 18) Prove that  $xJ_n^1(x)=nJ_n(x)-xJ_{n+1}(x)$
- 19) Prove that  $xJ_n^1(x)=-nJ_n(x)+xJ_{n-1}(x)$
- 20) Prove that  $J_{3/2}(x)=\sqrt{\frac{2}{\pi x}}[(1/x)\sin x-\cos x]$ .

UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)

ALL BLOOMS LEVEL 2 & 3

### Long Answer Questions

- 1) State and prove the necessary and sufficient condition for analyticity.
- 2) Prove that every analytic function  $f(z) = u + iv$  defines two families of curves  $u(x, y)=c_1$  and  $v(x, y) = c_2$  forming an orthogonal system.
- 3) State and prove the C-R equations in polar form?
- 4) Derive The necessary and sufficient condition for  $f(z)=w=u(x,y)+iv(x,y)$  to be analytic in Cartesian coordinate.
- 5) Show that  $u = \sin x \cosh y + 2 \cos x \sinh y + x^2 - y^2 + 4xy$  satisfy laplace equations. Find the corresponding analytical function.
- 6) Find the conjugate harmonic function of the harmonic function  $u = x^2 - y^2$
- 7) If  $f(z) = u + iv$  is an analytic function of  $z$  and if  $u - v = e^x (\cos y - \sin y)$  find  $f(z)$  in terms of  $z$ .
- 8) Prove that  $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} |\operatorname{Re} f(z)|^2 = 2|f'(z)|^2$
- 9) Find where the function
  - (i)  $w=1/z$
  - (ii)  $w=z/(1-z)$
  - (iii)  $w=(z+2)/(z(z^2+1))$
- 10) Show that an analytic function with constant absolute value is constant.

**II B.TECH I SEM ELECTRONICS AND COMMUNICATIONS ENGINEERING**  
**PROBABILITY THEORY AND STOCHASTIC PROCESSES**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long answer questions from the half of 3 rd unit)**

**Short Answer Questions 1 m questions      blooms level-1**

- 1) Define Exhaustive events and mutually exclusive events?
- 2) Define discrete sample space & continuous sample space?
- 3) State axioms of probability?
- 4) What are the different steps to derive Mathematical model of experiment and give example?
- 5) Define Joint and Conditional probability?
- 6) Derive any three properties of conditional probability?
- 7) State and Prove total probability theorem?
- 8) State and prove baye's Theorem?
- 9) Define Statistical Independent event?
- 10) State Multiplication theorem?
- 11) Defined combined sample space?
- 12) Define Permutation and Combination?
- 13) State the condition for independent events?
- 14) Define random variable?
- 15) State the conditions for a function to be a random variable?
- 16) Define random experiment?
- 17) Define discrete random variable?
- 18) Define mixed random variable?
- 19) Explain probability as a relative frequency?
- 20) Define an event?

## **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVEL 2 & 3**

1. State and prove total probability theorem?
2. Calculate the probability for selecting a ball of each color, if there is box has 500 colored balls. Those are 75 balls , 150 green ,175 red balls
3. If a three digit decimal number is chosen at random, find the probability that exactly K digits are greater than equal to 5, for  $0 \leq K \leq 3$ .
4. Calculate the probability that it is defective, if a company producing relays has 3 manufacturing plants producing 50 , 30 and 20% respectively. Suppose the probability that relay manufactured by these plants is defective are 0.02 , 0.05 and 0.01 respectively
5. A bag contains 8 red and 6 blue balls .Two drawings of 2 balls are made Find the probability that the first drawing gives 2 red balls and second drawing gives 2 blue balls, if the balls are replaced before the second draw?
6. Calculate the probability that not more than three will fail to return their keys , if the large hotel , it is knowns that 99% of all guests return room keys when checking out. If 250 members check out after a large conference
7. Box1 contain 2000 diodes of which 10 percent are defective. Box2 contain 3000 diodes of which 5% are defective. Two diodes are picked randomly from selected box. (i)find the probability that both diodes are defective. (ii)if both diodes are defective, calculate the probability that they came from box1.
8. A box contains 5 white, 2 red and 3 black balls. If 3 balls are drawn. Calculate the probability of getting all 3 balls of different colors?
9. A pack contain 4 white and 2 green pencils, another contains 3 white and 5 green pencils. If one pencil is drawn from each pack. find the probability that both are white.
10. A letter is known to have come either from LONDON or CLIFTON . on the postmark only the two consecutive letters “ON” are visible. Find the probability that it came from LONDON?
11. Show that the chances of throwing a six with 4, 3 or 2 dice respectively are 1:6:18
12. Find out the probability of drawing 3 white and 4 green balls from a bag that contains 5 white and 6 green balls, if 7 balls are drawn simultaneously at random.
13. A letter is known to have come either from TATANAGAR or CALCUTTA . on the postmark only the two consecutive letters TA” are visible. Find the probability that it came from CALCUTTA?
14. In a bolt factory, machines A,B,C manufactures 30% , 30%,40% of the total output respectively. From their outputs 4, 5, 3 percent are defective bolt. A bolt is drawn at random and found to be defective. Find the probability that it was manufactured by machine A,B and C
15. State and prove baye’s theorem?
16. A man is known to speak the truth 4 out of 5 times. He throws a die and reports that it is a one. Find the probability that it is actually one.
17. How do you explain statically independent events using baye’s rule.
18. An urn A contains 5 white and 3 black balls. Another urn B contains 3 white and 5 black balls.Two balls are taken from urn A randomly and are placed in urn B. Now, one Ball is taken from urn B.What is the probability that it is a black ball.
19. A trunk consists of 3 identical boxes .one box contains 1000 transistors of which 20% are defective, the 2<sup>nd</sup> box has 500 transistors which 40%.One defective and 3<sup>rd</sup> box contains 1500 components of which 400 are defective. A box is selected at random and a component is removed at random from the box. What is the probability that this component is defect. What is the probability by that it came from the first box?

20. A company producing relays has 3 manufacturing plants producing 50, 30 and 20 percent respectively of its product. Suppose that the probabilities that a relay manufactured by these plants is defective 0.02, 0.05 and 0.01 respectively.
- If a relay is selected at random from the output of the company, what is the probability that it is defective
  - If a relay selected at random is found to be defective, what is the probability that it was manufactured by plant 2?

## **UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)**

20 questions 1m and 20 questions(2m or 2.5 or 3m)

### **Short Answer Questions      I m questions blooms level-1**

- Define probability distribution function?
- Write any two properties of density function?
- Prove that Moment generating function of the sum of two independent variables is product of their Moment generating function
- Define uniform density function?
- Define Gaussian density function?
- If  $X$  is random variable, show that  $\text{Var}(aX+b)=a^2 \text{Var}(X)$
- Define Poisson distribution function?
- Define mean and mean square values?
- Define exponential density function?
- Define Rayleigh density function?
- State any two properties of variance?
- State the characteristics of Gaussian random variable?
- State the method of an event for conditional density?
- Define probability mass function?
- Define characteristic function?
- A random variable has mean of 18 and variance of 5 and its unknown distribution. Find  $p(8 < X < 18)$
- Define Variance and skew?
- Define Rayleigh distribution function?
- Define Transformations of a single variable?
- State and sketch the monotonically increasing and decreasing functions?

### **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

- Find  $\text{Var}(X)$  for a random variable  $X$  has a probability density.

$$f_x(x) = \begin{cases} (5/4)(1-x^4), & 0 < x \leq 1 \\ 0, & \text{elsewhere in } x \end{cases}$$

- Show that characteristic function of Gaussian random variable with zero mean and variance  $\sigma^2$  is

$$\Phi_x(w) = e^{\left(\frac{-\sigma^2 w^2}{2}\right)}$$

3. A random variable X has a probability density.

$$f_x(x) = \begin{cases} (1/2) \cos(x) & -\pi/2 < x < \pi/2 \\ 0 & \text{elsewhere in } x \end{cases}$$

Find the mean value of the function  $g(X) = 4X^2$

4. Find mean and variance of Binomial distribution function.

5. Life time of IC chips manufactured by a semiconductor manufacturer is approximately normally distributed with mean  $= 5 \times 10^6$  hours and standard deviation of  $5 \times 10^6$  hours. A mainframe manufacturer requires that atleast 95% of a batch should have a lifetime greater than  $4 \times 10^6$  hours. Will the deal be made?

6. Verify that the following is a valid distribution function or not

$$\begin{aligned} F(x) &= 0 && \text{for } x < a \\ &= 0.5\left(\frac{x}{a} + 1\right) && \text{for } -a \leq x \leq a \\ &= 1 && \text{for } x > a \end{aligned}$$

7. Find probability density function for The given characteristic function  $\Phi_x(w) = \exp(-|x|)$

8. Find mean of Gaussian distribution function.

9. Explain in detail about moments of a random variable

10. State and prove chebyshev's inequality

11. Find variance and skew of X for uniform probability density function

12. A random variable X has  $E(X) = -3$  and  $E(X^2) = 11$  and variance = 2. For a new random variable  $Y = 2X - 3$ , find (i)  $E(Y)$  ii)  $E(Y^2)$  iii) Variance of random variable Y

13. Find M.G.F And C.F of X for uniform probability density function

14. Find M.G.F of a Rayleigh distribution.

15. State and explain the properties of conditional density function?

16. State and explain the properties of distribution and density function?

17. State and explain the moment generating function of a random variable and its properties

18. Find characteristic function of a Poisson distribution

19. State and prove the moment generating function of a random variable and explain its properties

20. State and prove characteristic function of a random variable and explain its properties

### UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)

ALL BLOOMS LEVEL 2 & 3

#### Long Answer Questions

1. State and explain probability density function for two random variables?
2. State and explain probability distribution function for two random variables?
3. State and prove any four properties of joint probability density function?
4. State and explain conditional density function and its properties for two random variables?
5. State and prove Joint distribution properties
6. The joint PDF is  $f_{XY}(x,y) = \frac{1}{18} e^{-(x/6+y/3)}$  for  $x \geq 0, y \geq 0$

Show that X and Y are statistically independent random variables.

7. Explain sum of Two Random variable concept.
8. The joint PDF is  $f_{XY}(x,y) = \frac{1}{18} e^{-(x/6+y/3)}$  for  $x \geq 0, y \geq 0$

Show that X and Y are statistically independent random variables

9. The joint pdf is given as  $f(x,y) = A e^{-(2x+y)}$  for  $x \geq 0, y \geq 0$  Find the value of A and marginal density functions

10. Two random variables X and Y have a joint density function

$$f_{X,Y}(x,y) = \begin{cases} (5/16)x^2y & , 0 < y < x < 2 \\ 0 & , \text{Elsewhere} \end{cases}$$

Find the marginal density functions of X and Y. Are X and Y statically independent?



## SIGNALS AND SYSTEMS

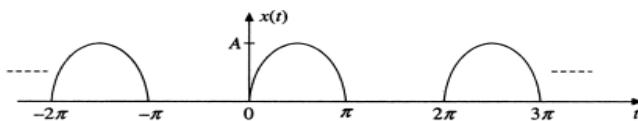
### Unit-I

#### PART A:

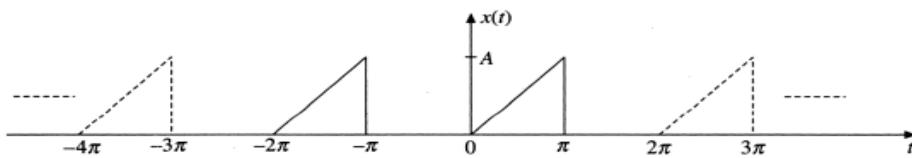
1. Define even and odd signal?
2. Define Energy and power signal.
3. Define unit pulse function.
4. Write down the trigonometric form of the fourier series representation of a periodic signal?
5. Write short notes on dirichlets conditions for fourier series.
6. State Time Shifting property in relation to fourier series.
7. Write down the exponential form of the fourier series representation of a periodic signal?
8. Define unit sinc signal.
9. Define unit signamfunction?
10. State Time integral property in relation to fourier series.
11. State Time scaling property in relation to fourier series.
12. State the orthogonality concept?
13. Sketch  $[u(t+2)-u(t-2)]$
14. Sketch  $[\pi(t/8)-4]$
15. Find Even and odd Components of  $x(t)=\sin t+\sin t \cos t+\cos t$
16. Define unit parabolic Signals
17. State Time Differentiation property in relation to fourier series.
18. Check whether  $[u(t+2)-u(t-2)]$  is energy or power signal
19. Check whether  $[u(t+2)-u(t-2)]$  is energy or power signal
20. Define deterministic and random Signals?

#### PART B:

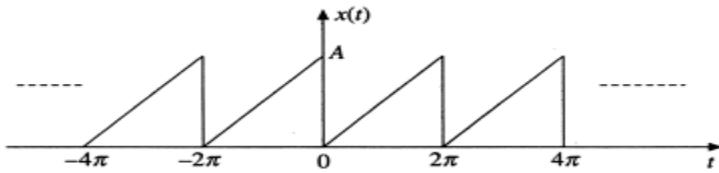
1. Calculate the Fourier series expansion of half wave rectified sine wave shown below?



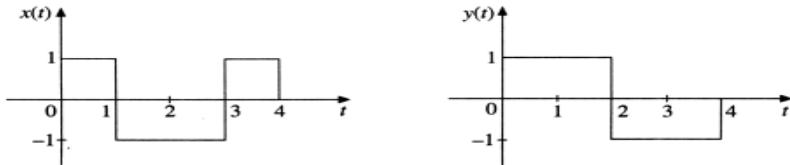
2. Obtain the trigonometric fourier series for the wave form shown below



3. Calculate the cosine Fourier series for the wave form shown below



4. Prove that signals  $x(t)$  and  $y(t)$  given in below figure are orthogonal to each other over an interval  $[0, 4]$ .



5. Prove that complex exponential signals are orthogonal functions?

6. Prove that functions  $x_p(t)$  and  $x_q(t)$  are orthogonal to each other over the period  $(0, T)$ .

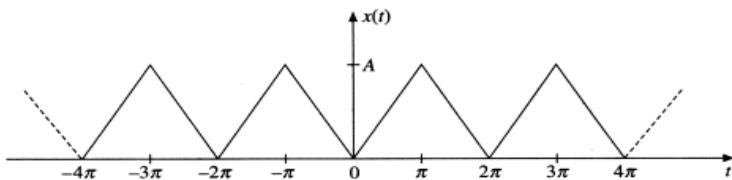
$$x_p(t) = \frac{1}{\sqrt{T}} (\cos p\omega_0 t + \sin p\omega_0 t) \quad x_q(t) = \frac{1}{\sqrt{T}} (\cos q\omega_0 t + \sin q\omega_0 t)$$

7. Show that the functions  $\sin nw_0 t$  and  $\cos mw_0 t$  are orthogonal over any interval  $[t_0, t_0 + 2\pi/w_0]$  for integral values of  $m$  and  $n$ .

8. Evaluate the mean square error for orthogonal space?

9. Evaluate the trigonometric Fourier series coefficients?

10. Find the Fourier series expansion for the given below wave form



11. Derive the exponential Fourier series and its coefficients?

12. Prove the Fourier series properties

- A. Convolution property B. Time integration property

13. State and Prove the Properties of Impulse Function

14. Explain the basic operations on signals with examples?

15. Justify

- A. Odd Functions have only Sine Terms
- B. Even Functions have no Sine terms
- C. Functions with half wave symmetry have only odd harmonics

16. Derive polar Fourier series from the exponential Fourier series representation and hence prove that  $D_n = 2|c_n|$

17. Derive the condition for orthogonality between two complex signals  $f_1(t)$  and  $f_2(t)$ .

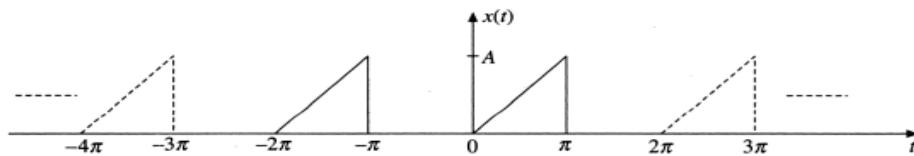
18. A rectangular function defined as

$$f(t) = \begin{cases} A & 0 < t < \pi/2 \\ -A & \pi/2 < t < 3\pi/2 \\ A & 3\pi/2 < t < 2\pi \end{cases}$$

Approximate the above function by a cosine between the intervals  $(0, 2\pi)$  such that the mean square error is minimum

19. Show that the signal  $x(t) = \sin w_0 t$  is periodic with period  $2\pi/w_0$

20. Obtain the Cosine Fourier series for the wave form shown below



## Unit-II

1. Define Fourier transform pair.
2. State Sampling theorem.
3. What is meant by aliasing?
4. How the aliasing process is eliminated.
5. Define Nyquist rate and Nyquist interval.
6. Write short notes on Dirichlet's conditions for Fourier transform.
7. State Time derivative property in relation to Fourier transform.
8. State convolution property in relation to Fourier transform.
9. Determine the Nyquist rate and Nyquist interval for  $x(t) = 1 + \cos 2000\pi t + \sin 4000\pi t$
10. What is Hilbert transform
11. What is the use of Fourier Transform
12. What is Frequency Spectrum?
13. What is the Fourier Transform of Periodic Signal?
14. Find  $\mathcal{F}(\cos w_0 t)$
15. Find  $\mathcal{F}(e^{-at|t|})$
16. Find  $\mathcal{F}[5 \sin^2(3t)]$
17. Find  $\mathcal{F}(\sin w_0 t)$
18. Find IFT of  $X(jw) = \delta(w - w_0)$
19. State Frequency shifting of Fourier transform.
20. What is the use of anti-aliasing filter?

**PART-B**

1. Derive the Fourier transform of a non-periodic signal from the Fourier series of a periodic signal.
2. Find the Fourier transform of triangular wave form?
3. Find the Fourier transform of signum function?
4. Find the Fourier transform of unit step function?
5. Find the Fourier transform of rectangle pulse function?
6. Prove the Fourier transform multiplication property?
7. Explain the natural sampling technique?
8. Find the transfer function of a zero order hold?
9. Give the graphical and analytical proof of sampling theorem for band limited signals
10. Explain natural sampling and flat sampling with equations and waveforms
11. Find the Fourier transform of a signal  $X(t)=2/(1+t^2)$
12. Show that  $F(j/\pi t)=\text{sgn}(w)$
13. State and Prove the modulation, conjugation and auto correlation properties of Fourier Transform?
14. Compute the fourier transform of the signal  $x(t)=1+\cos\pi t$  for  $|t|<1$
15. By Using Partial Fraction ,Find Inverse Fourier transform of

$$X(jw)=\{[4(jw)+6]/[(jw)^2+6(jw)+6]\}$$

16. By Using Partial Fraction ,Find Inverse Fourier transform of

$$X(jw)=\{[3(jw)+1]/[(jw+3)^2]\}$$

17. Find the convolution of the signals  $x_1(t)=e^{-2t} u(t)$  and  $x_2(t)=e^{-3t} u(t)$  ,Using Fourier Transform
18. Find Fourier Transform of  $x(t)=\sin(8t+0.1\pi)$
19. Sketch Frequency spectrum of  $F(e^{-2|t|})$
20. Sketch Frequency spectrum of  $F(e^{-3t} u(t))$

**Unit-III****PART-B**

1. What is an LTI system and give the properties of an LTI system
2. Explain how output and input signals are related to impulse response of LTI systems
3. Distinguish between the terms signal bandwidth and system band width
4. Let the system function of a LTI system be  $1/(jw+2)$  . What is the output of the system for an input  $(0.8)^t u(t)$ ?
5. For a system excited by  $x(t)=e^{-3t} u(t)$  ,The impulse response is  $h(t)= e^{-2t} u(t)+ e^{2t} u(-t)$  .Find the output for the system.
6. A system has an impulse response,  $h(t)=4e^{-4t} u(t)$ . Find the response of the system to  $x(t)=\text{rect}(t-1/4)$ .

7. Explain the terms

  - A. Causality    B.Stability
8. Explain about distortion less transmission through a system
9. Write notes on filter characteristics of linear systems
10. The input voltage to an RC circuit is given as  $x(t)=te^{-3t}u(t)$ ,and the impulse response of this circuit is given as  $2e^{-4t}u(t)$ .Determine the output  $y(t)$

**II B.TECH I SEM ELECTRONICS AND COMMUNICATIONS ENGINEERING**  
**SWITCHING THEORY AND LOGIC DESIGN**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long answer questions from the half of 3 rd unit)**

**Short Answer Questions I m questions      blooms level-1**

1. Write short notes on binary number systems..
2. Discuss 1"s and 2"s complement methods of subtraction?
3. Show how do you convert AND logic to NAND logic??
4. Illustrate about unit –distance code? State where they are used?
5. State about error correcting codes?
6. Convert the following number 10101100111.0101 to Base 10 ii.?
7. Convert the following number  $(153.513)_{10} = ( )_8$ ?
8. Obtain the binary of number code for the decimal numbers from 0 to 9?
9. Examine  $(72532 - 03250)$  using 9's complement?
10. Simplify to a sum of 3 terms:  $A'B'C' + ABD + A'C + A'CD' + AC'D + AB'C'$ ?
11. Simplify to a sum of 3 terms:  $A'C'D' + AC' + BCD + A'CD' + A'BC + AB'C'$ ?
12. How do you convert a2 level OR-AND circuit into an NAND-NAND circuit?
13. What are the steps required to convert AOI logic to NAND-NAND logic?
14. What are the steps required to convert AOI logic to NOR-NOR logic?
15. List the properties of XOR gate?
16. What are universal gates?
17. Give the truth table and expression for XOR gate?
18. What are multilevel NAND/NOR gates?
19. Convert  $(FACE)_{16}$  to binary?
20. Give the truth table and expression of XNOR gate?

### **Long Answer Questions (2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Discuss 1's and 2's complement methods of subtraction.
2. Describe a short note on number systems?
3. Perform arithmetic operation indicated below:
  - i.  $001110 + 110010$
  - ii.  $101011 - 100110$ .
4. Explain base conversion methods with examples?
5. Simplify to a sum of 3 terms:  $A'C'D' + AC' + BCD + A'CD' + A'BC + AB'C'$
6. Differentiate between binary code and BCD code?
7. Explain alpha numeric codes?
8. Convert  $(4085)_9$  into base-5?
9. Given  $AB' + AB = C$ , Show that  $AC' + A'C = B$
10. What is the gray code equivalent of the Hex Number 3A7?
11. Discuss error detecting and correcting codes?
12. Explain about multilevel nand/nor realization?
13. Explain about universal gates?
14. Explain how universal gates can realize AOI logic?
15. Discuss XOR gate and its properties
16. Explain how XOR gate can be realized using nand gates?
17. Explain how XNOR gate can be relized using nor gates?
18. Explain how XOR gate can be realized using nor gates?
19. Explain how XNOR gate can be relized using nand gates?
20. Discuss about SOP and POS forms?

### **UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)**

20 questions 1m and 20 questions (2m or 2.5 or 3m)

### **Short Answer Questions I m questions blooms level-1**

1. Define demultiplexer?
2. Define encoder and priority encoder?
3. Differentiate between multiplexer and demultiplexer?
4. Explain how decoder can be converted into a demultiplexer with a neat block diagram?

5. State the applications of multiplexer?
6. Compare and contrast between encoders and multiplexers?
7. Explain the working of 2:4 binary decoder?
8. Design a logic circuit to convert gray code to binary code?
9. Write the expressions for difference and borrow of a half-subtractor?
10. Realize full adder using two half adders?
11. What are the steps to design the combinational circuit?
12. Explain about Tri-state bus systems?
13. What are various types of hazards?
14. What are don't care conditions?
15. Define prime implicants and essential prime implicants?
16. Why minimization is required?
17. Explain about karnaugh maps?
18. Simplify  $AB + AB'C + ABC + BC$
19. Realize half adder using only NAND gates?
20. Simplify the following expression using Boolean algebra

$$F(X, Y, Z) = \sum m(3, 5, 7)$$

#### **Long Answer Questions (2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Design a 1-bit comparator using basic gates?
2. Design 1:16 demultiplexer using 1:4 demultiplexers?
3. Design a 2-bit comparator using gates?
4. Implement 8:1 multiplexer using 2:1 multiplexers?
5. Explain 8:1 multiplexer with the help of logic circuit and truth table?
6. Implement the following function using 8:1 multiplexer

$$F(A,B,C,D) = \sum m(0,1,5,6,8,10,12,15)$$

7. Implement full adder circuit using 8:1 multiplexer?
8. Implement the following function using decoder and OR gates

$$F_1(A,B,C,D) = \sum m(2,4,7,9) \quad F_2(A,B,C,D) = \sum m(10,13,14,15)$$

9. Design 2x4 decoder using NAND gates
10. Explain parallel adder and carry look ahead adder with neat diagrams?
11. Define full adder. Draw logic circuit and its truth table?
12. Simplify the following Boolean function using K-maps and implement using NAND gates

$$F(A,B,C,D) = \sum m(1,3,7,11,15) + d(0,2,5)$$

13. Simplify the following Boolean function using 5 variable K-map

$$F(A,B,C,D,E) = \sum m(0,5,6,8,9,10,11,16,20,24,25,26,27,29,31)$$

14. Simplify the following Boolean function using 5 variable K-map

$$F(A,B,C,D,E) = \sum m(0,1,4,5,16,17,21,25,29)$$

15. Reduce the following function using k-map and implement it in NAND as well as

NOR logic?

$$F(A,B,C) = \pi M(0,1,2,3,4,7)$$

16. Simplify the following Boolean function using K-maps and implement using NAND gates

$$F(A,B,C,D) = \sum m(4,5,7,12,14,15) + d(3,8,10)$$

17. Simplify the following Boolean function using Quine Mccluskey method

$$F(A,B,C,D) = \sum m(0,2,3,6,7,8,10,12,13)$$

18. Design a logic circuit to convert the 8421 BCD to Excess-3 code?

19. Design a 4-bit binary to BCD converter?

20. Design a combinational logic circuit defined by the functions

$$F_1 = a'b'c'd + a'c'd' + ab'cd'$$

$$F_2 = a'b'c + b'cde' + a'bcde'$$

$$F_3 = abcd' + ab'cd' + abcde'$$

UNIT-3(HALF UNIT and all 10 long answers only 2m or 2.5 or 3m)

ALL BLOOMS LEVEL 2 & 3

### Long Answer Questions

- 1) Compare RS and JK flip-flops.
- 2) Define Latch. Explain about Different types of Latches in detail?
- 3) Explain about all flip flops in detail with diagram.
- 4) Derive the characteristic equations for all Flip-Flops?
- 5) Differentiate combinational and sequential circuits
- 6) Explain the working principle of JK Flip-Flop in detail
- 7) What are the steps involved in the design of sequential circuits
- 8) Explain about RS and JK flipflops.
- 9) Derive a T-flip-flop from JK and D flip-flops?
- 10) Compare D flip-flop and T flip-flop?

**EEE I Mid Question Paper**

**Unit-1 -short answer questions**

- 1) Define Ohm's law
- 2) Mention the limitations of Ohm's Law
- 3) Define Kirchhoff's voltage law and Kirchhoff's Current law.
- 4) State Kirchhoff's Current law
- 5) Write short notes on resistor, capacitor, and inductor with relevant Expression
- 6) Give two applications of both series and parallel combination
- 7) State Kirchhoff's voltage law and Kirchhoff's Current law
- 8) State Ohm's law
- 9) Give an Examples of Series and Parallel Resistor Networks
- 10) Define a) Voltage b) Current c) Power
- 11) Write Short notes on different types of torques
- 12) Define a) Air friction damping b) Fluid friction damping c) Eddy current Damping
- 13) What is mean by instrument? Write Different types of instruments
- 14) Derive the star-delta conversion equations?
- 15) Write short notes on resistor, capacitor, and inductor with relevant expression
- 16) Given that the resistors  $R_a$ ,  $R_b$  and  $R_c$  are connected electrically in star. Write the equations for resistors in equivalent delta
- 17) What are the types of measuring instruments
- 18) Basic definitions of current and voltage, power
- 19) Write short notes on spring control mechanism
- 20) What is mean by instrument? Different types of instrument

**Unit-2 short answer questions**

- 1) What are the basic parts of a dc generator?
- 2) Discuss about back emf in DC motor?.
- 3) Describe the different types of Generators
- 4) Discuss about any two types of DC generators
- 5) What are the applications of DC motors?
- 6) Describe about Commutator principle of operation

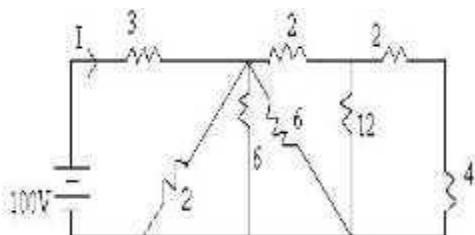
- 7) Differentiate between self-excited and separately excited DC machines.
  - 8) Calculate the e.m.f by 4 pole wave wound generator having 65 slots with 12 conductors per slot when driven at 1200 rpm the flux per pole is 0.02 wb.
  - 9) A dynamo has a rated armature current at 250 amps what is the current per path of the armature if the armature winding is lap or wave wound? The machine has 12 poles.
  - 10) Draw the characteristics for DC shunt generator.
- 
- 11) State Fleming's Right Hand Rule
  - 12) What is the basic principle of a dc generator?
  - 13) What are the basic parts of a dc generator?
  - 14) What are the different types of dc generators?
- 
- 15) Draw the circuit diagram of a Dc series motor Write down faraday's law of electromagnetic induction
- 
- 16) What are the applications of DC motors?
  - 17) State the function of commutator?
  - 18) Draw the open circuit characteristics of dc separately excited generator
- 
- 19) What do you mean by residual EMF in a generator
  - 20) Write different types of torques

### **Unit-3 short answer questions**

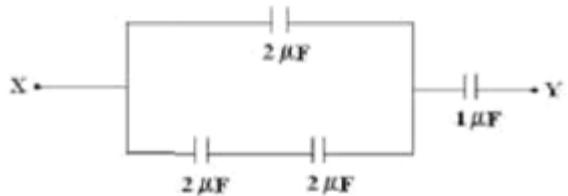
- 1) Mention the difference between core and shell type transformers.
- 2) Does transformer draw any current when secondary is open? Why?
- 3) Define voltage regulation of a transformer
- 4) Derive the EMF equation of a transformer..
- 5) Obtain the condition for maximum efficiency of a transformer
- 6) Describe the construction of a core type transformer.
- 7) Mention the difference between core and shell type transformers
- 8) Give the emf equation of a transformer and define each term
- 9) Define voltage regulation of a transformer
- 10) Define transformer.

## **Unit-1 -long answer questions**

- 1) Define voltage,current,power and energy with units.
- 2) Define active and passive elements with examples.
- 3) Describe the working principle of permanent magnet moving coil instrument
- 4) Describe the working principle of moving iron attraction type instrument
- 5) Discuss about series and parallel networks of resistor, inductor and capacitor.
- 6) Derive star-delta conversion equations?
- 7) Derive delta-star conversion equations?
- 8) Describe different types of elements with examples
- 9) Describe about series and parallel resistive and inductance, capacitor networks
- 10) Explain working principle of permanent magnet moving coil instrument
- 11) Describe working principle of moving iron attraction type instrument
- 12) Describe working principle of moving iron repulsion type instrument
- 13) Discuss working of different types of torques produced in indicating Instruments
- 14) Derive Expression for total resistance,inductance and capacitance when connected in series and parallel.
- 15) Explain with neat diagrams the types of controlling torques and damping torques.
- 16) Explain about moving iron attraction and repulsion type of measuring instrument.
- 17) Determine the current I in the circuit shown in figure. All resistances are in ohms.



- 18) An inductor having inductance of 2mH is charged to a current of 1A. Calculate the stored energy in joules
- 19) If 3 capacitors of values 2mF, 4mF, 5mF are connected in parallel. Calculate the effective capacitance.
- 20) Find the equivalent capacitance of the combination shown figure below across X and Y



## UNIT-II (DC MACHINES) long answer questions

- 1) Calculate the e.m.f by 4 pole wave wound generator having 65 slots with 12 conductors per slot when driven at 1200 rpm the flux per pole is 0.02 wb
- 2) A 6 pole lap wound dc generator has 600 conductors on its armature flux per pole is 0.02 wb. Calculate
  - a. The speed at which the generator must be run to generate 300v.
  - b. What would be the speed if the generated were wave wound
- 3) An 8-pole, lap wound armature rotated at 350 rpm is required to generate 260v. The useful flux per pole is 0.05 wb if the armature has 120 slots, calculate the number of conductors per slot.
- 4) A 440v Dc shunt generator has  $R_a=0.25$  ohms and  $R_{sh}=220$  ohms while delivering a load current of 50 amps, it has a terminal voltage of 440v determined the generated e.m.f and power developed?
- 5) A Dc series generator has armature resistance of 0.5 ohms and series field resistance of 0.03 ohms it drives a load of 50 amps. if it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm calculate the terminal voltage at the load. Assume 4 - poles, lap type winding, flux pole as 2 mwb and total brush drop as 2v.
- 6) A 4-pole lap wound dc shunt generator has a useful flux per pole of 0.07 wb. The armature winding consists of 220 turns, each of 0.04 ohms resistance. Calculate the terminal voltage when running at 900 rpm if the armature current is 50 amps.
- 7) A shunt generator supplies 9.6 amps at a terminal voltage of 200 volts the armature and shunt field resistances are 0.1 ohms and 50 ohms respectively. The iron and frictional losses are 2500 watts. Find i) E.m.f generated ii) copper losses iii) commercial efficiency
- 8) A 250 v shunt motor takes a total current of 20 amps the shunt field and armature resistances are 200 ohms and 0.3 ohms respectively determine i) Value of back E.m.f ii) gross mechanical power in the armature
- 9) Calculate the value of torque established by the armature of a 4pole motor having 774 conductors, two paths in parallel, 24 mwb flux per pole , when the total armature current is 50 a mps.

- 10) A 230v dc shunt motor takes a current of 40 amps and runs at 1100 rpm if armature and shunt field resistances are 0.25 ohms and 230 ohms respectively. Find the torque developed by armature
- 11) Describe the principle of operation of DC generator.
- 12) Derive the equation for induced EMF of a DC machine
- 13) Give the classification of DC generator and explain
- 14) Derive the torque equation of DC motor
- 15) Explain construction of dc machine with neat diagram?
- 16) A 6 pole lap wound dc generator has 600 conductors on its armature flux per pole is 0.02 wb.  
Calculate  
 i)The speed at which the generator must be run to generate 300v.  
 ii)What would be the speed if the generated were wave wound?
- 17) An 8-pole,lap wound armature rotated at 350 rpm is required to generate 260v. The use full flux per pole is 0.05 wb if the armature has 120 slots calculate the number of conductors per slot.
- 18) A 440v Dc shunt generator has  $R_a=0.25$  ohms and  $R_{sh}= 220$  ohms while delivering a load current of 50 amps, it has a terminal voltage of 440v determined the generated e.m.f and power developed?
- 19) A Dc series generator has armature resistance of 0.5 ohms and series field resistance of 0.03 ohms It drives a load of 50 amps. if it has 6 turns/coil and total 540 coils on the armature and is driven at 1500 rpm calculate the terminal voltage at the load. Assume 4-poles, lap type winding, flux pole as 2 mwb and total brush drop as 2V.
- 20) Explain three point starter for D.C. Shunt motor.

### **UNIT-III AC MACHINES long answer questions**

- 1) A transformer supplied a load of 32A at 415V. If the primary voltage is 3320V,find the following: (a)) Secondary volt ampere (b) Primary current (c) Primary volt ampere. Neglectt losses and magnetizing current
- 2) A 125 KVA transformer having primary voltage of 2000V at 50 Hz has 182 primary and 40 secondary turns. Neglecting losses, calculate i) The full load primary and secondary currents. ii) The no-load secondary induced emf. iii) Maximum flux in the core

- 3) A single phase transformer has 50 primary and 1000 secondary turns. Net cross sectional area of the core is 500 cm<sup>2</sup>. If the primary winding is connected to 50 Hz supply at 400 V, Calculate the value of Maximum flux density on the core and the emf induced in the secondary.
- 4) A transformer with 40 turns on the high voltage winding is used to step down the voltage from 240V to 120V. Find the number of turns in the low voltage winding. Open circuit and short circuit tests on a 5KVA, 220/400V, 50 Hz,single phase transformer gave the following results:OC Test: 220V, 2A, 100W (lv side)SC Test: 40V, 11.4A, 200W ( hv side)Obtain the equivalent circuit
- 5) Discuss about different types of losses in transformer.
- 6) Derive the EMF equation of a transformer.
- 7) Explain the principle of operation of transformer.
- 8) Describe the construction details of single phase transformer .
- 9) Discuss about different types of losses in transformer.
- 10) Describe the method to perform OC and SC test on a transformer.

### **EVS I MID Question Bank**

S. No	Questions	BLOOMS TAXONOMY LEVEL
<b>UNIT – I (SHORT ANSWERS)</b>		
1	Define ecology and ecosystem.	Remember
2	Differentiate between food chain and food web.	Understand
3	Briefly explain the importance of ecological pyramids	Remember
4	Define biogeochemical cycles? Explain their importance.	Understand
5	List the factors make a desert ecosystem	Remember
6	Briefly discuss about grassland ecosystem	Understand
7	Explain few important characteristics of a forest ecosystem	Remember
8	Explain why there are only 4 to 5 tropic levels in any ecosystem	Understand
9	Briefly discuss an aquatic ecosystem.	Remember
10	Define biomagnifications	Understand
11	Define bioaccumulation	Remember
12	Define carrying capacity?	Understand
13	Define primary production and secondary production.	Remember
14	Define ecological pyramids.	Understand
15	Define pyramid of energy.	Remember
16	Differentiate between grazing food chain detritus food chain.	Understand
17	List the different tropic levels of ecosystem?	Remember
18	Define decomposers?	Understand
19	Define photosynthesis process.	Remember
20	List the types of grasslands in India and two animal species found in the grass land .	Understand
<b>UNIT-II NATURAL RESOURCES(SHORT ANSWERS)</b>		
1	Discuss some of the water resources problems in India.	
		Remember
2	Discuss the problems of over exploitation of ground water.	Understand
3	Explain the causes for floods.	Remember
4	Discuss the methods of flood control.	Remember
5	Define desertification?	Remember
6	Define aquifer?	Remember
7	Enlist different surface and ground water resources.	Remember
8	List the environmental effects of using of mineral resources?	Remember
9	define mineral? What is its use?	Remember
10	Name the non renewable resources?	Remember

11	Define water logging?	Remember
12	Define soil erosion?	Remember
13	List the effects of soil pollution?	Remember
14	Differentiate soil texture and structure	Remember
15	Define green fuels?	Remember
16	Outline the role of geo thermal energy in India?	Remember
17	List the different type's energies which can be derived from the ocean?	Remember
18	Define solar cells.	Remember
19	Define pesticides? Mention it types.	Remember
20	List the different types of natural resources	Remember

#### UNIT-III BIO – DIVERSITY & BIOTIC RESOURCES(SORT ANSWERS)

1	Enumerate the biogeographical classification of India.	Remember
2	define hot spots of biodiversity? Mention the three hot spots in India.	Understand
3	Differentiate between endanger and endemic species.	Remember
4	Define red data book?	Understand
5	Define endemic species? Name some endemic species in India.	Remember
6	List the indirect values of biodiversity.	Understand
7	Define biological diversity.	Remember
8	Differentiate genetic and species diversity.	Understand
9	Define vulnerable & Extinct species.	Remember
10	List out the names 10 Bio geo graphical regions of India.	Understand

UNIT – I ECO SYSTEM (LONG ANSWER QUESTIONS)		
1	Explain energy flow pattern in different types of ecosystem	Remember
2	Discuss the major characteristics features of a river ecosystem different from lake ecosystem	Understand
3	List the main components of ecosystem and briefly describe the functions of each.	Remember
4	Explain the role of producers, consumers and decomposers in an ecosystem with practical example.	Understand
5	What would happen to an ecosystem if all its decomposer and detritus feeder were eliminate.	Remember
6	List the food chain and food web? give example and discuss their significance.	Understand
7	List the biogeochemical cycles? Explain nitrogen cycle with help of a diagram.	Remember
8	Define the ecological pyramids? Explain why some of these pyramids are upright while others are inverted in different ecosystem.	Understand
9	Explain energy flow of the ecosystem.	Remember
10	Name all the cycles that constitute the proper functioning of an ecosystem.	Understand
11	Explain bio magnification with examples.	Remember
12	Primary and secondary Productivity.	Understand
13	Explain about the structure of Ecosystem.	Remember
14	Write a detailed note on Carrying Capacity	Understand
15	What are the values getting from Ecosystem.	Remember
16	Define Ecosystem. Explain the importance and concept of ecosystem.	Understand
17	Define food chain . Explain the types of food chain.	Remember
18	Ocean Ecosystem of structure and function.	Understand
19	Classification of Ecosystem in Detailed.	Remember
20	Explain about Desert Ecosystem.	Understand

#### UNIT-II NATURAL RESOURCES(LONG ANSWERS)

1	List the Natural resources and write the classification of resources.	Remember
2	Explain the Big dams - Benefits and problems.	Understand
3	List the Mineral Resources, uses and exploitation?	Remember

4	List the alternate energy sources? Explain their present status, merits and demerits.	Understand
5	Explain the environmental impacts of (i) Fertilizer – Pesticides (ii). Over grazing.	Remember
6	Define mining. Explain various impacts of mineral extraction.	Understand
7	List the importance of forest ecological wealth of country?	Remember
8	Discuss about the soil texture, structure and its composition.	Understand
9	Write a short note on wind energy; also discuss its advantages and limitations.	Remember
10	List the different types of energies which can be derived from the ocean? Explain briefly along with their advantages and limitations.	Understand
11	Explain underground water usage effects.	Remember
12	Write a note on i)floods ii)drought	Understand
13	Define mining & explain types of mining.	Remember
14	Define land slides- explain major reasons to cause of land slides.	Understand
15	Write full notes on non renewable energy resources.	Remember
16	Explain about important solar harvesting devices.	Understand
17	Explain about Bio gas & its benefits.	Remember
18	Define wind Energy & Explain its Advantages , disadvantages.	Understand
19	Explain the types of soil erosion and its consequences.	Remember
20	Define tidal energy. Explain the types indetailed.	Understand

UNIT-III BIO – DIVERSITY & BIOTIC RESOURCES (LONG ANSWER QUESTIONS)		
1	Define bio diversity? Explain different types of Bio diversity.	Remember
2	Summarize consumptive use value, productive use value, social value and ethical values of biodiversity.	Understand
3	How to study of biodiversity is beneficial to human life.	Understand
4	Define bio diversity. Explain genetic biodiversity, species diversity and ecosystem diversity?	Remember
5	Discuss the status of India as a mega diversity nation of biodiversity.	Understand
6	List the different services that are contributed in various ways by biodiversity?	Remember
7	Explain endangered species of India.	Understand
8	Discuss the concept of bio diversity at three hierarchical levels.	Remember
9	Define various species of biodiversity. Explain any 2 species with example in detailed.	Understand
10	Discuss the importance (uses) of biodiversity regarding direct and indirect values.	Remember

## **MID-I**

### **METALLURGY AND MATERIAL SCIENCE**

#### **Unit-1 (Short Answers)**

1. Define Unit cell and Space Lattice
2. Differentiate between crystalline solids and amorphous solids
3. What is the necessity of Alloying.
4. Write the specific effects of alloying elements?
5. Write about Gibbs Phase Rule
6. Write about Isomorphous phase diagram .
7. Write short notes on Medium Carbon Steels.
8. Write short notes on High Carbon Steels.
9. Define Atomic Packing factor and co-ordinate number.
10. Find the atomic packing factor of B.C.C, F.C.C and H.C.P.
11. What are the types of solid solutions and explain them.
12. Write Hume-Rothery rules?
13. Write short notes on Effect of Grain Boundary
14. What is Miller Indices
15. Explain about metallic bond with a suitable example?
16. Explain the ionic bond with a suitable example?
17. Explain about covalent bond with a suitable example?
18. What are the types of dislocations?
19. What are the crystal structures?
20. Difference between crystalline and non-crystalline

#### **UNIT-1 (Long Answers)**

1. What are the crystal structures explain in brief?
2. What is alloy ? what are the necessary for alloying?
3. What are the lattice parameters of SC,FCC,BCC?
4. Define solid solution? What are the types of solid solutions and explain them.
5. Elaborate a) ionic bond b) covalent bond c) co ordinate covalent bond d) metallic bond
6. Define crystal structure? What are the different types of crystal structures?
7. Define grain? What is the Effect of Grain Boundary
8. Define crystalline, non crystalline? Difference between crystalline and non-crystalline
9. Explain briefly about miller indices?
10. What are different rules followed by hume rothery rules?
11. Find the atomic packing factor of B.C.C, F.C.C and S.C?
12. Describe about a) miller indices b) solid solutions
13. Describe briefly about a) interstitial solid solutions b) substitutional solutions
14. What is atomic packing factor? Calculate the packing efficiency?
15. Elaborate about intermediate solid solutions?
16. Explain the relation between space lattice, basis, unit cell?
17. Define dendrite? Explain different types of dendrites?
18. What are the effects of grain size on properties of metals?
19. Briefly explain about grain and grain boundary?
20. Define ASTM? What is the formula for measuring grain size?

## **UNIT-2 (Short Answers)**

1. Write about Lever Rule.
2. Write about Non Equilibrium cooling-Coring.
3. Explain the following with applications Tool and Die Steels.
4. Explain the following with applications Hadified Manganese Steels.
5. What is a Eutectic System alloy and what are its characteristics?
6. List out the common intermediate alloy phases and explain any one of them with example?
7. Define Alloy, Phase and Structure.
8. Write difference between substitutional solid solutions and interstitial solid solutions.
9. Draw a new sketch of cooling curves of pure metal and alloys?
10. What are the binary phase diagrams and explain any one of them?
11. what is meant by phase?
- 12 what is meant by unary phase system?
- 13 what is meant by binary phase system?
14. what is meant by terenary phase system?
15. explain about gibbs phase rule?
16. define isomorphous system?
17. explain about equilibrium diagrams?
18. briefly explain about partial eutectic system?
19. define the transformations in binary system?
20. define system, phase, component?

## **UNIT-2 (Long Answers)**

1. Define phase? What are different types of phases?
2. What are the different equilibrium diagrams?
3. What are different types of transformations in binary phase diagram?
4. Explain about unary phase diagram with an example phase diagram?
5. Explain about binary phase diagram with an example phase diagram?
6. Explain about binary phase transformation diagram with an example phase diagram?
7. What is phase rule?explain?
8. How gibbs explained about phases? Determine the composition of materials using gibbs phase rule?
9. Explain briefly about lever rule?
10. Explain briefly about isomorphous system?
11. Define eutectic phase? Explain briefly with an example?
12. Define eutectoid phase? Explain briefly with an example?
13. Define peritectic phase? Explain briefly with an example?
14. Define peritectoid phase? Explain briefly with an example?
15. Briefly explain the transformations about eutectic,peritectic,eutectoid,peritectoid
16. Draw a new sketch of Cooling curves of pure metal and alloys?
17. Explain about the invariant reactions in binary
18. How to determine the cooling curves? Explain with neat diagrams?
19. Determine the construction of phase diagrams?
20. Briefly describe about cooling curves and classify?

### **UNIT-3 (Short Answers)**

1. Define the term allotropy and draw a neat sketch of allotropic forms of Pure Iron.
2. What are the Solid phases in Iron-Carbon Equilibrium diagram and explain them.
3. Write short notes on Classification of Steels.
4. Write short notes on Low Alloy Steels.
- 5 .Write short notes on Alloys Steels
6. Write short notes on Plain Carbon Steels.
7. What is meant by heat treatment process?
8. What are the different types of microstructures?
9. What is the different heat treatment process?
10. Define annealing?

### **UNIT-3**

1. Define heat treatments? What are different heat treatment process?
2. What is alloy? Explain about alloy steels?
3. Define steel? Classify steels?
4. Describe a) plain carbon steels b) alloy steels
5. Briefly explain about a)alloy steels b) low carbon steels
6. Define microstructure? What are the different microstructure explain briefly?
7. What is allotropy? Explain its transformations?
8. Define annealing? Explain the process in annealing?
9. Explain about heat treatments process in metallurgical behavior of metals?
10. Draw the different types of microstructures? Explain?

**MECHANICS OF SOLIDS**  
**Unit-I**

**Small answer questions**

1. Define the elastic property
2. What do you mean by plasticity
3. Define ductility of material
4. Explain about brittle property
5. Discuss about factor of safety
6. Define stress and strain
7. List the different types of stress
8. List the different types of strain
9. State and discuss about Hooke's law
10. Define Poisson's ratio
11. What do you mean by bar of uniform strength
12. Analyze the thermal stress
13. What is bulk modulus of elasticity
14. Define Young's modulus
15. Briefly explain about modulus of rigidity
16. State the principle of shear stress
17. Derive the expression for elongation of a bar due to its own weight
18. What do you mean by Strain energy
19. Define the term Resilience
20. Derive the expression for maximum strain energy stored in a body

**Long answer questions**

1. Explain the stress-strain relations for brittle and ductile materials.
2. A 20mm diameter brass rod was subjected to a tensile load of 40kN. Find the extension of length 200mm.
3. A steel bar 15mm in diameter is pulled axially by a force of 10KN. If the bar is 250mm long. Calculate the strain energy stored per unit volume of the bar and the total strain energy stored by the bar. (Take  $E = 2 \times 10^5$  MPa).
4. Define volumetric strain and derive an expression for volumetric strain of a Circular rod
5. The extension in a rectangular steel bar of length 400mm and thickness 10mm, is found to be 0.21mm. The bar tapers uniformly in width from 100mm to 50mm. If  $E$  for the bar is  $2 \times 10^5$  N/mm<sup>2</sup>, determine the axial tensile load on the bar.
6. A circular rod of diameter 16 mm and 500 mm long is subjected to a tensile force 40 kN. The modulus of elasticity for steel may be taken as 200 kN/mm<sup>2</sup>. Find stress, strain and elongation of the bar due to applied load,
7. The ultimate tensile stress for a hollow steel column which carries an axial load of 2MN is 500N/mm<sup>2</sup>. If the external diameter of the column is 250mm, determine the internal diameter. Take FOS as 4.0

8. A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60 kN is applied, the extension measured over a gauge length of 200mm is 0.12mm and contraction in diameter is 0.0045mm. Find Poisson's ratio and elastic constants E, G, and K
9. Derive an expression between modulus of elasticity and modulus of rigidity.
10. Determine the changes in length and breadth and thickness of a steel bar which is 5m long, 40mm wide and 30mm thick and is subjected to an axial pull of 35kN in the direction of the length. Take  $E = 2 \times 10^5 \text{ N/mm}^2$  and Poisson's ratio 0.23.
11. A compound bar consists of a circular rod of steel of 25 mm diameter rigidly fixed into a copper tube of internal diameter 25 mm and external diameter 40 mm as shown in Fig. 8.37. If the compound bar is subjected to a load of 120 kN, find the stresses developed in the two materials. Take  $E_s = 2 \times 10^5 \text{ N/mm}^2$  and  $E_c = 1.2 \times 10^5 \text{ N/mm}^2$
12. Determine the Poisson's ratio and bulk modulus of a material for which the Young's modulus is  $1.2 \times 10^5 \text{ N/mm}^2$  and modulus of rigidity is  $4.5 \times 10^4 \text{ N/mm}^2$ .
13. A tensile test was conducted on a mild steel bar. The following data was obtained from the test: (i) Diameter of the steel bar = 3 cm (ii) Gauge length of the bar = 20cm (iii) Load at elastic limit = 250 kN (iv) Extension at a load of 150 kN = 0.21 mm (v) Maximum load = 380 kN (vi) Total extension = 60 mm (vii) Diameter of rod at failure = 2.25 cm Determine: (1) The Young's modulus (2) The stress at elastic limit (3) The percentage of elongation (4) The percentage decrease in area.
14. Derive Expression for Young's modulus in terms of bulk modulus?
15. Draw stress - strain diagram for mild steel. Indicate salient points and clearly explain the stages
16. 10. A bar 30 mm in diameter and 200mm long was subjected to an axial pull of 60 kN. The extension of the bar was found to be 0.1 mm, while decrease in the diameter was found to be 0.004 mm. Find the Young's modulus, Poisson's ratio, rigidity modulus and bulk modulus of the material of the bar.
17. A reinforced concrete column 500x500 mm in section is reinforced with a steel bar of 25mm diameter, one in each corner, the column is carrying the load of 1000 KN Find the stresses induced in the concrete and steel bar. Take  $E$  for steel =  $2.1 \times 10^5 \text{ N/mm}^2$  and  $E$  for concrete =  $1.4 \times 10^3 \text{ N/mm}^2$
18. A steel bolt of 20 mm diameter passes centrally through a copper tube of internal diameter 28 mm and external diameter 40 mm. The length of whole assembly is 600 mm. After tight fitting of the assembly, the nut is over tightened by quarter of a turn. What are the stresses introduced in the bolt and tube, if pitch of nut is 2 mm? Take  $E_s = 2 \times 10^5 \text{ N/mm}^2$  and  $E_c = 1.2 \times 10^5 \text{ N/mm}^2$
19. A compound bar is made of a steel plate 50 mm wide and 10 mm thick to which copper plates of size 40 mm wide and 5 mm thick are connected rigidly on each side as shown in Fig. 8.48. The length of the bar at normal temperature is 1 m. If the

temperature is raised by  $80^\circ$ , determine the stresses in each metal and the change in length. Given  $\alpha_s = 12 \times 10^{-6}/^\circ\text{C}$ ,  $\alpha_c = 17 \times 10^{-6}/^\circ\text{C}$ ,  $E_s = 2 \times 10^5 \text{ N/mm}^2$ ,  $E_c = 1 \times 10^5 \text{ N/mm}^2$

20. Derive relation for change in length of the bar of uniformly tapering rectangular section subjected to an axial tensile load  $p$ . Derive the expression for strain energy when the load is applied with impact
21. Derive the expression for strain energy when the load is applied gradually and also for suddenly applied load.
22. 15. Derive relation for change in length of the bar of uniformly tapering circular section subjected to an axial tensile load  $p$ .
23. A steel rod of 3 cm diameter is enclosed centrally in a hollow copper tube of external diameter 5 cm and internal diameter of 4 cm. the composite bar is then subjected to an axial pull of 45000N. If the length of each bar is equal to 15cm,determine
  - a. The stress in the rod and tube
  - b. load carried by each bar
  - c. Take E for steel =  $2.1 \times 10^5 \text{ N/mm}^2$  and for copper =  $1.1 \times 10^5 \text{ N/mm}^2$

## UNIT-II

### Short answer questions

1. Define beam. What are the types of Beams?
2. Define and explain the following terms: Shear force, Bending moment, Shear force diagram & bending moment diagram.
3. What are the sign conventions for shear force & bending moment in general?
4. Draw the S.F. & B.M. diagrams for simply supported beam of length L carrying a point load W at its middle point.
5. What do you mean by point of contra flexure?
6. Sketch any two types of supports used for a beam indicating the reactions in each case.
7. A cantilever beam of span 4m is subjected to a UDL of 2 kN/m over its entire length. Sketch the bending moment diagram for the beam.
8. Give the relationship between B.M. & S.F. and rate of loading in a beam.
9. What is the maximum bending moment in a simply supported beam of span "L" subjected to UDL of "w" over entire span.
10. How do you locate the point of maximum bending moment?
11. Differentiate between hogging & sagging bending moment

12. When will be Bending Moment maximum?
13. What is the maximum bending moment in a simply supported beam of span L subjected to UDL of  $w$  over entire span.
14. In a simply supported beam how will you locate point of maximum bending moment?
15. What is Shear Force?
16. What is Shear Force & Bending Moment Diagrams?
17. Explain the important points for drawing Shear Force & Bending Moment diagrams.
18. What are the types of loads? Explain.
19. In which point the Bending Moment is maximum?
20. Derive the relation between bending moment & shear force

#### LONG ANSWER QUESTIONS:

1. A simply supported beam of 10m long carries a uniformly distributed load  $2\text{kN/m}$  over entire length and point loads  $1\text{kN}$  and  $2\text{kN}$  at distances  $2\text{m}$  and  $5\text{m}$  from the left support. Draw the shear force and bending moment diagrams.
2. A beam AB, 1.2m long, is simply-supported at its ends A and B and carries two concentrated loads, one of  $10\text{ kN}$  at C, the other  $15\text{ kN}$  at D. Point C is  $0.4\text{ m}$  from A, point D is  $1\text{ m}$  from A. Draw the S.F. and B.M. diagrams for the beam.
3. A cantilever beam AB, 2.5 m long is rigidly built in at A and carries vertical concentrated loads of  $8\text{ kN}$  at B and  $12\text{ kN}$  at C,  $1\text{ m}$  from A. Draw S.F. and B.M. diagrams for the beam.
4. A beam AB, 5 m long, is simply-supported at the end B and at a point C,  $1\text{ m}$  from A. It carries vertical loads of  $5\text{ kN}$  at A and  $20\text{kN}$  at D, the centre of the span BC. Draw the shear force and bending moment diagrams.
5. A beam AB, 3 m long, is simply-supported at A and B. It carries a  $16\text{ kN}$  concentrated load at C,  $1.2\text{ m}$  from A, and a u.d.l. of  $5\text{ kN/m}$  over the remainder of the beam. Draw the S.F. and B.M. diagrams and determine the value of the maximum B.M.
6. A beam 4.2m long overhangs each of two simple supports by  $0.6\text{m}$ . The beam carries a uniformly distributed load of  $30\text{ kN/m}$  between supports together with concentrated

loads of 20 kN and 30 kN at the two ends. Sketch the S.F. and B.M. diagrams for the beam and hence determine the position of any points of contraflexure.

7. A simply supported beam has a span of 4m and carries a uniformly distributed load of 60 kN/m together with a central concentrated load of 40kN. Draw the S.F. and B.M. diagrams for the beam and hence determine the maximum B.M. acting on the beam.
8. A beam  $ABCDE$  is simply supported at  $A$  and  $D$ . It carries the following loading: a distributed load of 30 kN/m between  $A$  and  $B$ ; a concentrated load of 20 kN at  $B$ ; a concentrated load of 20 kN at  $C$ ; a concentrated load of 10 kN at  $E$ ; a distributed load of 60 kN/m between  $D$  and  $E$ . Span  $AB = 1.5$  m,  $BC = CD = DE = 1$  m. Calculate the value of the reactions at  $A$  and  $D$  and hence draw the S.F. and B.M. diagrams. What are the magnitude and position of the maximum B.M. on the beam?
9. A simply supported beam has a span of 6m and carries a distributed load which varies in a linear manner from 30 kN/m at one support to 90 kN/m at the other support. Locate the point of maximum bending moment and calculate the value of this maximum. Sketch the S.F. and B.M. diagrams.
10. A beam  $ABCD$  is simply supported at  $B$  and  $C$  with  $AB = CD = 2$ m;  $BC = 4$ m. It carries a point load of 60 kN at the free end  $A$ , a uniformly distributed load of 60 kN/m between Band C and an anticlockwise moment of 80 kN m in the plane of the beam applied at the free end  $D$ . Sketch and dimension the S.F. and B.M. diagrams, and determine the position and magnitude of the maximum bending moment.
11. A cantilever beam of length 2m carries a uniformly distributed load of 2 kN /m over the whole length and a point load of 3 kN at the free end. Draw the SF and BM diagrams.
12. A simply supported beam of length 8 m rests on supports 5 m apart, the right hand end is overhanging by 2 m and the left hand end is overhanging by 1m. The beam carries a uniformly distributed load of 5kN/m over the entire length. It also carries two point loads of 4kN and 6 kN at each end of them. The load 4kN is at the extreme left of the beam, whereas the load of 6 kN is at the extreme right of the beam. Draw S.F. and B.M. diagrams for the beam and find the points of contraflexure.
13. A simply supported beam of length 8 m rests on supports 6 m apart, the right hand end is overhanging by 2 m. The beam carries a uniformly distributed load of 1500 N/m over the entire length. Draw S.F. and B.M. diagrams for the beam and find the points of contraflexure.

14. A simply supported beam of length 8 m carries point loads of 4 kN, 10 kN and 7 kN at a distance of 1.5 m, 2.5 m and 2 m respectively from left end A. Draw S.F. and B.M. diagrams for the beam and also calculate the maximum B.M on the section.
15. A cantilever of length 6 m carries a gradually varying load, zero at the free end to the 2 kN/m at the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.
16. A cantilever of length 2 m carries a point load of 1kN at its free end and another load of 2 kN at a distance of 1 m from the free end. Draw the S.F. and B.M. diagrams for the cantilever.
17. A cantilever of length 4 m carries point loads of 1kN, 2 kN and 3 kN at 1, 2 and 4 m from the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.
18. A cantilever of length 2 m carries a uniformly distributed load of 3 kN/m run over a length of 1m from the fixed end. Draw the S.F. and B.M. diagrams for the cantilever.
19. A cantilever of length 5 m carries a uniformly distributed load of 2 kN/m over the entire length and a point load of 4 kN at the free end. Draw the S.F. and B.M. diagrams for the cantilever.
20. A simply supported beam of length 5 m, carries a uniformly distributed load of 100 N/m extending from the left end to a point 2 m away. There is also a clockwise couple of 1500 Nm applied at the centre of the beam. Draw S.F. and B.M. diagrams for the beam and also calculate the maximum B.M on the section.

### UNIT-III

#### **Short answer questions**

1. Define the bending stress.
2. What do you mean by simple bending
3. What do you mean by pure bending
4. Explain about neutral axis
5. What is the meaning of strength of section

6. Discuss about section modulus
7. Define the term Moment of resistance
8. Explain about neutral surface
9. Compare the section modulus for circular section and hollow circular section
10. What do you mean by beams with uniform bending strength

#### LONG ANSWER QUESTIONS

1. A steel plate of width 60mm and thickness 10mm is bent into a circular arc of radius 10m. determine the max stress induced and the bending moment which will produce the max stress. Take  $E = 2 \times 10^5 \text{ N/mm}^2$ .
2. Calculate the max stress induced in a cast iron pipe of external diameter 40mm of internal diameter 20mm and of length 4m when the pipe is supported at its ends and carries a point load of 80N at the center.
3. Derive bending equation  $M/I = f/y = E/R$ .
4. Discuss the assumptions involved in the theory of simple bending
5. A cast iron beam has an I-section with top angle 100mm  $\times$  40mm, web 140mm  $\times$  20mm and bottom angle 180mm  $\times$  40mm. If tensile stress is not to exceed 35MPa and compressive stress 95MPa, what is the maximum uniformly distributed load the beam can carry over a simply supported span of 6.5m
6. Derive section modulus for rectangular and circular beams
7. A circular steel pipe of external diameter 60 mm and thickness 8 mm is used as a simply supported beam over an effective span of 2 m. If permissible stress in steel is 150 N/mm<sup>2</sup>, determine the maximum concentrated load that can be carried by it at mid span
8. A circular bar of simply supported span 1 m has to carry a central concentrated load of 800 N. Find the diameter of the bar required, if permissible stress is 150 N/mm<sup>2</sup>.
9. A cantilever of 3 m span, carrying uniformly distributed load of 3 kN/m is to be designed using cast iron rectangular section. Permissible stresses in cast iron are  $f = 30 \text{ N/mm}^2$  in tension and  $f_c = 90 \text{ N/mm}^2$  in compression. Proportion the section suitably
10. The cross-section of a cast iron beam is as shown in Fig. 10.14(a). The top flange is in compression and bottom flange is in tension. Permissible stress in tension is 30 N/mm<sup>2</sup> and its value in compression is 90 N/mm<sup>2</sup>. What is the maximum uniformly distributed load the beam can carry over a simply supported span of 5 m?

**II B.TECH I SEM COMPUTER SCIENCE ENGINEERING**  
**PROBABILITY AND STATISTICS**  
**MID I QUESTION BANK**

**UNIT-1(ALL BLOOMS LEVELS)**

**20 questions 1m(BLOOMS LEVEL-1) and 20 questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3 from each unit(20+20 from unit 1 and 20+20 from unit 2 and only 10 long answer questions from the half of 3 rd unit)**

**Short Answer Questions 1 M questions      blooms level-1**

1. Define discrete random variable and continuous random variable?
2. Describe the types of random variables?
3. Define the probability distribution function?
4. List two properties of probability function?
5. Define the expectation of discrete random variable?
6. List out the probability distributions?
7. Show that the mean of binomial distribution is  $np$
8. Describe about moment generating function of Poisson distribution?
9. Define the mean and mode of normal distribution?
10. Define moment about origin?
11. Write the recurrence relation of Poisson distribution.
12. Write the formula for Normal distribution function?
13. What is the total probability of Normal curve?
14. Describe the Variance of normal distribution
15. Define the moment generating function Binomial distribution?
16. Find K from the following table

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

17. Show that  $E(X+Y) = E(X) + E(Y)$

18. If  $f(x)$  is the distribution function x given by

$$F(x) = \begin{cases} 0 & \text{if } x \leq 1, \\ k(x-1)^4 & \text{if } 1 < x \leq 3, \\ 1 & \text{if } x > 1 \end{cases}$$

Determine  $f(x)$

19. Let  $F(X)$  be the distribution function of random variable X given by

$$f(x) = \begin{cases} cx^3, \text{when } 0 \leq x \leq 3 \\ 1, \text{when } x > 3 \\ 0, \text{when } x \leq 0 \end{cases}$$

Determine c

20. The mean and variance of binomial distribution are 4 and  $4/3$  respectively.

Find  $p(x>1)$ .

### Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

1. (i) The mean and variance of binomial distribution are 4 and  $4/3$  respectively. Find  $p(x>1)$ .  
 (ii) Let  $x$  denote the number of heads in a single toss of 4 fair coins. determine (a)  $p(x \leq 2)$  (b)  $p(1 \leq x \leq 3)$
2. Average number of accidents on any duty on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) at most one.
2. Derive the formulae for finding Mean, Median and Mode of a Normal distribution?
3. Derive Mean and Variance of a Poisson distribution?
4. In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and S.D. of the distribution?
5. A random variable x has the following probability distribution.

x	1	2	3	4	5	6	7	8
P(x=x)	k	2k	3k	4k	5k	6k	7k	8k

Find the value of

- (i) K (ii)  $p(x \leq 2)$  (iii)  $p(2 \leq x \leq 5)$ .

6. Let  $F(X)$  be the distribution function of random variable  $X$  given by

$$f(x) = \begin{cases} cx^3, & \text{when } 0 \leq x \leq 3 \\ 1, & \text{when } x > 3 \\ 0, & \text{when } x \leq 0 \end{cases}$$

Determine (i)  $c$  (ii) mean (iii)  $p(x>1)$

7. If the masses of 300 students are normally distributed with mean 68 kgs and standard deviation 3 kgs how many students have masses (i) Greater than 72 kgs (ii) Less than or equal to 64 kgs (iii) Between 65 and 71 kgs inclusive ?

8. 20% of its items produced from a factory are defective. Find the probability that i) None is defective. ii) One is defective iii)  $P(1 < X < 4)$

9. Given that  $p(x=2)=9p(x=4)+90$   $p(x=46)$  for a Poisson variate  $X$ .

Find (i)  $P(x=4)$  (ii).  $p(x \geq 1)$

10. (a) A coin is biased in a way that a head is twice as likely to occur as a tail. If the coin is tossed 3 times, find the probability of getting 2 tails and 1 head

(b) If  $X$  is the continuous random variable whose density function is  $f(x) = x$  if  $0 < x < 1 = (2-x)$  if  $1 \leq x < 2 = 0$ , else where Find  $E(25X^2 + 30X - 5)$

11. If the Mean of a Poisson variable is 1.8, then

find (i)  $p(x > 1)$  (ii)  $p(x=5)$  (iii).  $p(0 < x < 5)$

12. For the discrete probability distribution

$X$	0	1	2	3	4	5	6
$P(X)$	0	$2k$	$2k$	$3k$	$k^2$	$2k^2$	$7k^2 + k$

Find i)  $k$  ii) mean iii) Variance.

13. The mean and standard deviation of a normal variable are 8 and 4 respectively.

find i)  $p(5 \leq x \leq 10)$  ii)  $p(x \geq 5)$

14.a) If in eight throws of a fair die, getting a 5 or 6 is considered as a success, find the mean and the standard deviation of the successes.

b) The mean and variance of binomial distribution are 4 and  $4/3$  respectively.

Find the probability of occurrence of at most one success.

15. If  $X$  is a normal variate with mean 30 and the standard deviation 5, find

the probabilities that (a)  $26 \leq X \leq 40$  (b)  $X \geq 45$ .

16. A random variable  $X$  has density function

$$f(x) = \begin{cases} ce^{-3x} & x > 0 \\ 0 & \text{elsewhere.} \end{cases}$$

Find (a) the constant  $c$  (b)  $P(1 < X < 2)$  (c)  $P(X \geq 3)$ .

17. A random variable  $X$  has density function:  $f(x) = \begin{cases} k(1-x^2) & 0 < x < 1 \\ 0 & \text{elsewhere.} \end{cases}$

Find the value of  $k$  and the probabilities that  $X$  will take on a value

(a) between 0.1 and 0.2 (b) greater than 0.5.

18. In a normal distribution 31% of the items are under 31% and 8% are over 64.

Find the mean and standard deviation of the distribution.

19. Define probability density function. If a random variable has the probability density function

$$f(x) = \begin{cases} 2e^{-2x} & x > 0 \\ 0 & \text{elsewhere,} \end{cases}$$

find the probabilities that it will take on a value

(a) between 1 and 3 (b) greater than 0.5.

20. Prove that a) Mean of binomial distribution is  $np$

And b) Variance of a binomial distribution is  $np(1-p)$

## UNIT-2 (ALL BLOOMS LEVEL 3 AND ABOVE)

20 questions 1m and 20 questions(2m or 2.5 or 3m)

**Short Answer Questions      1M questions      blooms level-1**

1. Define joint probability mass function?

2. Define joint probability density function?

3. Define marginal probability mass function?

4. Define marginal probability density function?

5. Write the relation between coefficient of correlation and regression coefficient?

6. The two regression equations of the variables  $x$  and  $y$  are  $x = 19.13 - 0.87y$  and  $y = 11.64 - 0.50x$ . Then find correlation coefficient between  $x$  &  $y$ ?

7. The two regression equations of the variables  $x$  and  $y$  are  $x = 20.12 - 0.87y$  and  $y = 13.64 - 0.50x$ . Then find mean of  $x$ ?

8. The two regression equations of the variables  $x$  and  $y$  are  $x = 13.42 - 0.87y$  and  $y = 16.94 - 0.50x$ . Then find mean of  $y$ ?

9. If  $\sum x = 28, \sum y = 28$  and  $\sum xy = 112$ . Then find  $COV(x, y)$ ?

10. Define Rank correlation

11. Write the formula for Rank Correlation Coefficient if the ranks are repeated.
12. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from actual mean.
13. Write the formula for Karl Pearson's Correlation coefficient if the deviations are taken from assumed mean.
14. Write the formula for Regression equation of X on Y.
15. Write the formula for Regression equation of Y on X.
16. Write the formula for regression coefficient of X on Y if the deviations are taken from Assumed Mean.
17. Write the formula for angle between two Regression lines.
18. Write any two properties of Correlation Coefficient.
19. Write any two properties of joint probability density function.
20. Write the formula for Covariance of two random variables if X, Y are continuous random variables.

#### **Long Answer Questions(2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3**

1. Ten participants in a contest are ranked by two judges as follows

X	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient?

2. Psychological tests of intelligence and of engineering ability were applied to 10 students. Hence is a record of ungrouped data showing intelligence ratio (I.R.) and engineering ratio (E.R.) Calculate the coefficient of correlation.

Student	A	B	C	D	E	F	G	H	I	J
I.R.	105	104	102	101	100	99	98	96	93	92
E.R.	101	103	100	98	95	96	104	92	97	94

3. The correlation table given below shows that the ages of husband and wife of 53 married couples living together on the census night of 1991. Calculate the coefficient of correlation between the age of the husband and that of the wife.

Age of husband	Age of wife						Total
	15-25	25-35	35-45	45-55	55-65	65-75	
15-25	1	1	-	-	-	-	2
25-35	2	12	1	-	-	-	15
35-45	-	4	10	1	-	-	15
45-55	-	-	3	6	1	-	10
55-65	-	-	-	2	4	2	8
65-75	-	-	-	-	1	2	3
Total	3	17	14	9	6	4	53

4. In the following table are recorded data showing the test scores made by salesmen on an intelligence test and their weekly sales.

Sales men	1	2	3	4	5	6	7	8	9	10
Test Scores	40	70	50	60	80	50	90	40	60	60
Sales('000)	2.5	6.0	4.5	5.0	4.5	2.0	5.5	3.0	4.5	3.0

Calculate the regression line of sales on test scores and estimate the most probable weekly sales volume if a sales man makes a score of 70?

5. If  $\theta$  is an angle between two regression lines show that  $\tan \theta = \frac{1-r^2}{r} \cdot \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ . Explain the significance when  $r = 0$  and  $r = \pm 1$ .
6. Find if there is any significant correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

7. Find Karl Pearson's coefficient of correlation from the following data

Wages	100	101	102	102	100	99	97	98	96	95
Cost of living	98	99	99	97	95	92	95	94	90	91

8. A random sample of 5 college students is selected and their grades in Mathematics and Statistics are found to be the following. Find the coefficient of correlation between them

	1	2	3	4	5
Mathematics	85	60	73	40	90
Statistics	93	75	65	50	80

9. Find the regression line of x on y for the following data

X	10	12	13	16	17	20	25
Y	10	22	24	27	29	33	37

10. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

11. Find if there is any significance correlation between the heights and weights given below

Heights in inches	57	59	62	63	64	65	55	58	57
Weights in lbs	113	117	126	126	130	129	111	116	112

12. Calculate coefficient of correlation from the following data

X	12	9	8	10	11	13	7
Y	14	8	6	9	11	12	3

13. Suppose the random variables X, Y have the joint density function defined by

$$f(x, y) = c(2x + y), 2 < x < 6, 0 < y < 5 \text{ and } f(x, y) = 0, \text{Otherwise. Find}$$

$$(i) c \quad (ii) P(x > 3, y > 2)$$

14. From the Following data, Calculate the expected value of Y when X=12

Given  $r=0.99$

	X	Y
Average	7.6	14.8
Standard deviation	3.6	2.5

15. From the following data Calculate (i) correlation coefficient

(ii) Standard Deviation of  $Y(\sigma_y)$ .  $b_{xy} = 0.85$ ,  $b_{yx} = 0.89$ ,  $\sigma_x = 3$

16. If  $\sigma_x = \sigma_y = \sigma$  and the angle between the regression lines is  $\tan^{-1}\left(\frac{4}{3}\right)$  then find  $r$ .

17. If  $r_{12}=0.5$ ,  $r_{31}=0.3$ ,  $r_{23}=0.45$ ,  $r_{31}=0.3$  then find the value of  $R_{3,12}$

18. Given the following data  $r_{12}=0.8$   $r_{13}=0.7$   $r_{23}=0.6$   $\sigma_1=10$   $\sigma_2=8$   $\sigma_3=5$  determine regression of  $X_1$  on  $X_2$  &  $X_3$

19. a single correlation between yield  $x_1$  & temperature  $x_2$  & rainfall  $X_3$  are given by  $r_{12}=0.6$   $r_{23}=0.8$   $r_{31}=0.5$  find the multiple correlation co efficient

20. find the mean values of the variable  $X$  &  $Y$  and correlation coefficient from the following regression line  $3Y-2X-10=0$ ,  $2Y-X-50=0$

**UNIT-3(HALF UNIT and all 10 long answer only 2m or 2.5 or 3m)**

ALL BLOOMS LEVEL 2 & 3

### Long Answer Questions

1. (i) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs.487 with a standard deviation Rs.48. with what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 478.6 to 495.4.
2. Sample of size 2 are taken from the population 4,8,12,16,20,24 with out replacement. Find (a) Mean of the population (b) Standard deviation of the population (c) The mean of the sampling distribution of the means (d) the standard deviation of the sampling distributions of means.
3. A sample of 900 members is found to have a mean of 3.4 cm. Can it be reasonably regarded as a truly random sample from a large population with mean 3.25 cm and S.D. 1.61cm?
4. The means of simple samples of sizes 1000 and 2000 are 67.5 and 68.0 cm respectively. Can the samples be regarded as drawn from the same population of S.D. 2.5cm?
5. An unbiased coin is thrown  $n$  times. It is desired that the relative frequency of the appearance of heads should lie between 0.49 and 0.51. Find the smallest value of  $n$  that will ensure this result with 90% confidence?

6. A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure. 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure?
7. 11 students were given a test in statistics they were given a month's further tuition and a second test of equal difficulty was held at the end of it. Do the marks give evidence that the students have benefited by extra coaching?

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

8. Two horses A and B were tested according to the time in seconds to run a particular race with the following results. Test whether you can discriminate between two horses

Horse A	28	30	32	33	33	29	34
Horse B	29	30	30	24	27	29	--

9. The results of polls conducted 2 weeks and 4 weeks before a election are shown in the following table:

	Two weeks before election	4 weeks before election
For Democratic candidate	84	66
Undecided	37	43
For Republican candidate	79	91

Use the 0.05 level of significance to test whether there has been a change in opinion during the 2 weeks between the rolls.

10. The measurements of the output of two units have given the following results. Assuming that both samples have been level whether the two populations have the same variance.

Unit-A	14.1	10.1	14.7	13.7	14.0
Unit-B	14.0	14.5	13.7	12.7	14.1

## **I-MID Examinations Question Bank**

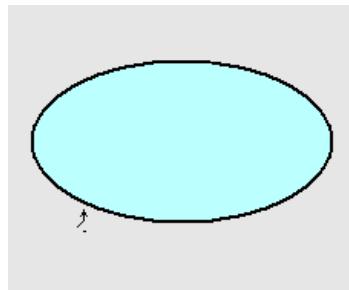
**II B.Tech . I Sem**

**Branch: Mechanical**

**Name of the Subject: THERMODYNAMICS**

### **Short Answer Questions I m questions      blooms level-1**

1. Define Closed System, Open System and Isolated System.
2. List some of the thermodynamics properties
3. Explain the intensive and extensive properties.
4. List the point functions and path functions.
5. Explain thermodynamic equilibrium.
6. Describe thermodynamics cycle.
7. Explain first law of thermodynamics.
8. Define zeroth law of thermodynamics.
9. List the differences between Open system and Closed system.
10. Define thermodynamic system, surrounding and universe.
11. Define thermodynamics process.
12. Label the thermodynamic system, boundary and surrounding of the give figure.



13. Draw the P-V diagram of Isobaric process.
14. List the modes of heat transfers.
15. Describe PMM I.
16. Sketch the control volume of nozzle and turbine.
17. Write the
18. Define thermodynamic work.
19. Define thermometer and thermometry.

20. Draw the sign conventions of heat interaction and work interactions

### Long Answer Questions (2m or 2.5 or 3m) OF BLOOMS LEVE 2 & 3

#### Question bank

1. Explain the Joule's experiment with a neat sketch.
2. Give examples of closed, open and isolated systems.
3. Prove that heat and work are path functions.
4. State and explain the zeroth law of thermodynamics.
5. State the limitations of first law of thermodynamics.
6. Explain the constant volume gas thermometer.
7. Distinguish open system and closed system.
8. To a closed system 100 kJ of work is supplied. If the initial volume is  $0.5 \text{ m}^3$  and pressure of a system changes as  $P = (8 - 4 V)$ , where P is in bar and V is in  $\text{m}^3$ , Compute the final volume and pressure of the system.
9. Why PMM1 is impossible? Justify.
10. A stationary mass of gas is compressed without friction from an initial state of  $0.3 \text{ m}^3$  and 0.105 MPa to a final state of  $0.15 \text{ m}^3$  and 0.105 MPa, the pressure remaining constant during the process. There is a transfer of 37.6 kJ of heat from the gas during the process. Calculate the change in internal energy of the gas change?
11. If a gas of volume  $6000 \text{ cm}^3$  and at pressure of 100 kPa is compressed quasi-statically according to  $pV^2 = \text{constant}$  until the volume becomes  $2000 \text{ cm}^3$ , compute the final pressure and the work transfer.
12. Air flows steadily at the rate of 0.5 kg/s through an air compressor, entering at 7 m/s velocity, 100 kPa pressure, and  $0.95 \text{ m}^3/\text{kg}$  volume, and leaving at 5 m/s, 700 kPa, and  $0.19 \text{ m}^3/\text{kg}$ . The internal energy of the air leaving is 90 kJ/kg greater than that of the air entering. Cooling water in the compressor jackets absorbs heat from the air at the rate of 58 kW. Compute the rate of shaft work input to the air in kW.
13. In a steady flow apparatus, 135 kJ of work is done by each kg of fluid. The specific volume of the fluid, pressure, and velocity at the inlet are  $0.37 \text{ m}^3/\text{kg}$ , 600 kPa, and 16 m/s. The inlet is 32 m above the floor, and the discharge pipe is at floor level. The discharge conditions are  $0.62 \text{ m}^3/\text{kg}$ , 100 kPa, and 270 m/s. The total heat loss between the inlet and discharge is 9 kJ/kg of fluid. In flowing through this apparatus, does the specific internal energy increase or decrease, and justify?
14. Derive the displacement work in a polytropic process  $pV^n=C$ .
15. Explain the quasi-static process with a neat sketch.
16. Gas from a bottle of compressed helium is used to inflate an inelastic flexible balloon, originally folded completely flat to a volume of  $0.5 \text{ m}^3$ . If the barometer reads 760 mm of Hg, what is the amount of work done upon the atmosphere by the balloon? Sketch the system before and after the process.
17. A mass of 1.5 kg of air is compressed in a quasi-static process from 0.1 MPa to 0.7 MPa for which  $pv = \text{constant}$ . The initial density of air is  $1.16 \text{ kg/m}^3$ . Compute the work done by the piston to compress the air.
18. Prove that the internal energy is a property of the system.
19. A mass of 2.5 kg of air is compressed in a quasi static process from 0.1 MPa to 0.7 MPa for which  $PV = \text{constant}$ . The initial specific volume is  $0.80 \text{ m}^3/\text{kg}$ . Compute the work done by the piston to compress the air.

20. Differentiate the microscopic and macroscopic viewpoints.

### Short answers questions Unit II

1. Define thermal energy reservoir.
2. Define heat engine and draw a neat sketch
3. Define heat pump and draw a neat sketch
4. Define refrigerator and draw a neat sketch
5. Define COP and write the equations for heat pump and refrigerator.
6. Define Kelvin Planck statement of II law of Thermodynamics.
7. Define Clausius statement of II law of Thermodynamics.
8. Define thermal efficiency of a heat engine cycle. Can this be 100%.
9. List the processes in Carnot cycle.
10. State the Clausius inequality.
11. Define mechanical energy reservoir
12. Define the term entropy
13. List some high grade energies and low grade energies.
14. Define the term available energy.
15. What are Helmholtz function and Gibbs function?
16. List few Maxwell's equations.
17. Write the Clausius-chaperon equation.
18. Define third law of thermodynamics.
19. What is dead state?
20. State the Carnot principles.

### Long answer questions Unit II

1. Differentiate the terms heat engine and heat pump.
2. Explain the Carnot cycle with p-v diagram
3. Explain the equivalence of Kelvin Planck and Clausius statements of second law of thermodynamics.
4. Prove that entropy is a property of a system.
5. Explain the inequality of Clausius.
6. An inventor claims to have developed an engine that takes in 105 MJ at a temperature of 200 K, and delivers 15kWh of mechanical work. Would you advise investing money to put this engine in the market?
7. A reversible heat engine working between two thermal reservoirs at 875 K and 315 K drives a reversible refrigerator which operates between the same 315 K reservoir and a reservoir at 260 K. The engine is supplied 2000 kJ of heat and the network output from the composite system is 350 kJ. Calculate the heat transfer to the refrigerator and the new heat interaction with the reservoir at 315 K temperature.
8. Using an engine of 30% thermal efficiency to drive a refrigerator having a COP of 5, compute the heat input into the engine for each MJ removed from the cold body by the refrigerator?
9. A heat engine receives half of its heat supply at 1000 K and half at 500 K while rejecting heat to a sink at 300 K. What is the maximum possible thermal efficiency of this heat engine?
10. A reversible heat engine operates between 875 K and 310 K and deliver a reversible refrigerator operating between 310 K and 255 K. The engine receives 2000 kJ of heat and new work output from the arrangement equals to 350 kJ. Calculate the cooling effect of refrigerator.
11. Explain the Kelvin Planck and Clausius statements.

12. 0.2 kg of air at 300  $^{\circ}\text{C}$  is heated reversibly at constant pressure to 2066 K. Find the available and unavailable energies of the heat added. Take  $T_0 = 30 ^{\circ}\text{C}$  and  $c_p = 1.004 \text{ kJ/kg K}$ .
13. Explain the available energy referred to a cycle.
14. Explain the Maxwell's equations.
15. Explain the Gibb's and Helmholtz function
16. Two kg of air at 500 kPa, 80  $^{\circ}\text{C}$  expands adiabatically in a closed system until its volume is doubled and its temperature becomes equal to that of the surroundings which is at 100 kPa, 5  $^{\circ}\text{C}$ . For this process, determine (a) the maximum work (b) the change in availability, and (c) the irreversibility. For air, take  $c_v = 0.718 \text{ kJ/kg K}$ ,  $u = c_v T$  where  $c_v$  is constant, and  $pV = mRT$  where  $p$  is pressure in kPa,  $V$  volume in  $\text{m}^3$ ,  $m$  mass in kg,  $R$  a constant equal to 0.287 kJ/kg K, and  $T$  temperature in K.
17. Explain Clausius-Claperyon equation.
18. A reversible power cycle is used to drive a reversible heat pump cycle. The power cycle takes in  $Q_1$  heat units at  $T_1$  and rejects  $Q_2$  at  $T_2$ . The heat pump abstracts  $Q_4$  from the sink at  $T_4$  and discharges  $Q_3$  at  $T_3$ . Develop an expression for the ratio of  $Q_4/Q_1$  in terms of the four temperatures.
19. Explain the Carnot's theorem.
20. Explain the corollary of Carnot's theorem.

### Unit – III

#### Short answer questions

1. State Boyle's law
2. Define ideal gas.
3. Define equation of state.
4. Define Charle's law.
5. Define Vander Wall's equation
6. Define perfect gas.
7. Describe compressibility chart.
8. Define throttling process.
9. Define expansion process.
10. Define real gases.