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UNITED INSTITUTE OF TECHNOLOGY

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Periyanaickenpalayam, Coimbatore – 641020

BE3251 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

I YEAR
Common to
(CSE, AI&DS, CSE – CS, IT)

II SEMESTER

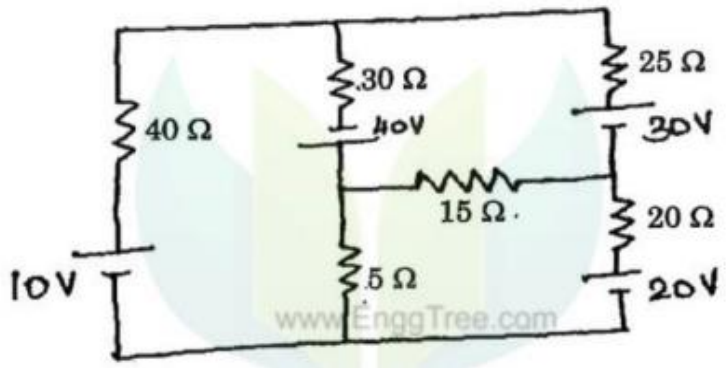
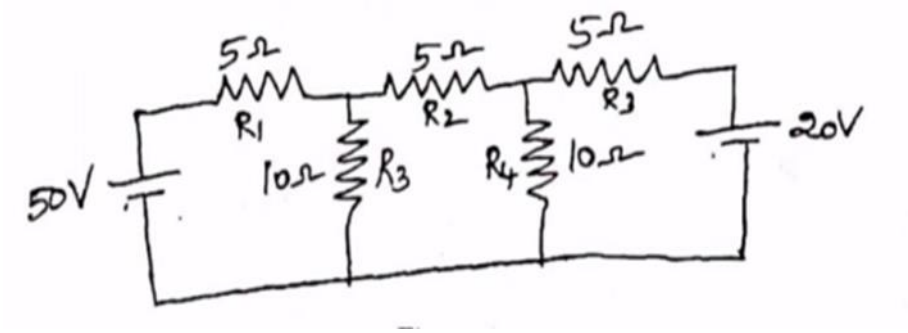
ACADEMIC YEAR 2023 – 2024

PREPARED BY	**VERIFIED BY**	**APPROVED BY**

UNIT I
ELECTRICAL CIRCUITS

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm's Law Kirchhoff's Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state) Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state analysis of RLC circuits (Simple problems only).

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Ohm's law and Kirchhoff's law.	1	1	2
2.	What is an independent and dependent source? Give an example.	1	1	2
3.	State the difference between mesh analysis and nodal analysis.	1	2	2
4.	What is the function of a resistor, inductor and capacitor in a DC circuit?	1	1	2
5.	Define RMS, reactive power, total power and average value.	1	1	2
6.	Define form factor, power factor, peak factor and real power.	1	1	2
7.	Differentiate between instantaneous power and apparent power.	1	2	2
8.	Write the units of resistance, inductance, and capacitance.	1	1	2
	PART B			
1.	(i) A sinusoidal voltage V = 200 sin 314t is applied to a 10Ω resistor. Find (a) Frequency, (b) RMS Voltage, (c) RMS current and (d) Power dissipated as heat.	1	4	8
	(ii) In the parallel circuit shown in figure, the power in the 5Ω resistor is 600 W and the total circuit takes 3000 VA at leading power factor of 0.707. Find the value of impedance Z.			8

2.	(i) A series circuit has R = 10Ω, L = 50 mH, and C = 100 μF and is supplied with 200 V, 50 Hz. Find 1) Impedance, 2) Current, 3) Power, 4) Power factor, 5) Voltage drop across the each element.	1	4	8
	(ii) An AC circuit is composed of a serial connection of a resistor with resistance 50Ω, a coil with inductance 0.3 H and a capacitor with capacitance 15 μF. The circuit is connected to an AC voltage source with amplitude 25 V and frequency 50 Hz. Determine the amplitude of electric current in the circuit and a phase difference between the voltage and the current. Draw the Phasor diagram of voltages and current in the circuit.			8
3.	(i) Derive the expression for RMS value of an alternating quantity.	1	2	8
	(ii) Explain about the working of RLC series circuit and derive the relationships. Give the necessary phasor diagrams.	1	2	8
4.	(i) Determine the current passing through 15 Ω resistor in the circuit, using mesh analysis. 	1	4	8
	(ii) Using the nodal analysis, find the current through the resistances R3 and R4 for the circuit shown in figure. 			8

UNIT II

ELECTRICAL MACHINES

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the EMF equation of a DC generator.	2	1	2
2.	Formulate the relationship between torque and slip of induction motor?	2	2	2
3.	What is the principle of operation of a single-phase transformer? List the various applications of transformer.	2	1	2
4.	A six pole lap wound DC generator has 660 conductors a flux of 20mwb per pole is driven at 20 rpm, find the generator emf.	2	3	2
5.	Define synchronous motor and give one application.	2	1	2
6.	List two applications of squirrel-cage induction motors.	2	1	2
7.	What is hunting in synchronous machines?	2	1	2
8.	How transformers are classified? And give its classifications?	2	1	2

PART B

1.	(i) Explain the construction and working principle of a self-excited DC generator, characteristics and derive its EMF equation.	2	4	10
	(ii) Describe the working principle of a DC shunt motor and derive its torque equation. Explain how speed varies with armature voltage.			6
2.	(i) Define transformer efficiency and voltage regulation. Explain how these are determined from OC/SC tests.	2	2	8
	(ii) Explain the principle of operation of a transformer.			8
3.	Design a synchronous motor-based power-factor correction scheme for a 500 kW industrial load at 0.75 lagging pf. Calculate required kVAR and specify motor rating.	2	6	16
4.	(i) State the various part of transformer and their function in details?	2	2	8
	(ii) Compare induction motor and transformer.			8

UNIT III

ANALOG ELECTRONICS

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon & Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET, IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define latching and holding circuit of SCR.	3	1	2
2.	List the applications of zener diode, PN junction diode, Transistor and IGBTs.	3	1	2
3.	Explain the different regions of transistor characteristics.	3	2	2
4.	JFET is voltage operated device. Why?	3	1	2
5.	Draw the symbol of diode, zener diode, BJT and UJT.	3	1	2
6.	Compare intrinsic and extrinsic semiconductor.	3	2	2
7.	Compare the operation of rectifiers and invertors.	3	2	2
8.	Write short notes on zener voltage regulator with neat diagram.	3	2	2

PART B

1.	Explain in detail about the construction, principles of operation and VI characteristics of PN junction diode and zener diode.	3	2	16
2.	(i) Explain with a neat sketch the construction and working characteristics of IGBT.	3	2	10
	(ii) Explain in detail about the working principle of JFET.			6
3.	What is rectifier? What are the types of rectifier? Derive the expression for full wave rectifier.	3	2	16
4.	(i) Explain the constructional details and different modes of operation of MOSFET.	3	2	10
	(ii) Explain the working principle and operation of SCR.			6

UNIT IV

DIGITAL ELECTRONICS

Review of number systems, binary codes, error detection and correction codes, Combinational logic – representation of logic functions-SOP and POS forms, K-map representations – minimization using K maps (Simple Problems only)

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the four possible elementary operations simple binary addition consists of.	4	1	2
2.	What are Combinational circuits?	4	1	2
3.	Convert Excess-3 to BCD code: $(1101101011)_2$	4	2	2
4.	Write down the Sum and Carry expression for Half adder.	4	1	2
5.	Define error detection and correction code.	4	1	2
6.	Mention the significance of K map.	4	2	2
7.	Convert the given expression in Canonical SOP form Y=AC+AB+BC	4	2	2
8.	State De-Morgan's theorem.	4	1	2

PART B

1.	Simplify the Boolean function, f(W,X,Y,Z)=WX'Y'+WY+W'YZ'	4	4	16
2.	For the Truth Table 1, obtain the simplifies sum of products expression using K Map and realize it using only NAND gate. Observe that this is the output of a majority voting circuit.	4	4	16

Truth table 1

A	B	C	Y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

3.	What is a K-Map? Simplify the Boolean function F (w, x y z) = $\sum_m$ (1, 2, 4, 5, 6, 8, 9, 12, 13, 14) using K-Map.	4	4	16
4.	With neat diagram, explain the error detection and correction code. Give an example.	4	4	16

UNIT V

MEASUREMENTS AND INSTRUMENTATION

Functional elements of an instrument, Standards and calibration, Operating Principle, types of Moving Coil and Moving Iron meters, Measurement of three-phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the five functional elements and types of possible errors of a measurement system.	5	1	2
2.	Define the primary sensing element in an instrument.	5	1	2
3.	Name the three categories of calibration standards.	5	1	2
4.	Compare current and potential transformer.	5	2	2
5.	State the applications of transformers.	5	1	2
6.	What is the fundamental operating principle of a moving-iron meter?	5	1	2
7.	Which method uses two wattmeters to measure three-phase power in a balanced three-wire system?	5	1	2
8.	What is the role of the ADC in a DSO?	5	1	2

PART B

1.	(i) Describe the working principle of three phase AC energy meter.	5	2	8
	(ii) Explain the working principle of an electrodynamometer wattmeter.			8
2.	(i) Discuss the Gilbert multiplier cell in detail. Provide circuit diagram and its operation.	5	2	8
	(ii) Explain the different types of errors in measurements.			8
3.	(i) Describe the construction and working of a single-phase induction energy meter.	5	2	8
	(ii) Derive the torque equation for moving iron instrument and comment on the shape of the scale?			8
4.	(i) Explain the measurement of power in three phase circuit using two wattmeter methods.	5	2	8
	(ii) With a block diagram, explain the data acquisition pathway in a DSO.			8

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MA3251
Statistics and Numerical Methods

UNIT I

TESTING OF HYPOTHESIS

Sampling distributions – Tests for single mean and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Type-I and Type-II errors.	1	1	2
2.	Define the following terms: Statistic, Parameter, Standard Error and Random Sampling.	1	1	2
3.	What is sampling distribution?	1	1	2
4.	What are null and alternate hypothesis?	1	1	2
5.	State the important properties of 't' distribution.	1	1	2
6.	Mention the various steps involved in testing of hypothesis.	1	1	2
7.	Define χ^2 test for goodness of fit.	1	1	2
8.	Give the application of χ^2 test.	1	1	2
	PART B			
1.	A sample of 900 members has a mean 3.4 cm and standard deviation 261 cm. Is the sample from large population of mean 3.25 cm and standard deviation 2.61 cm?	1	2	8
2.	A random sample of 100 bulbs from a company P shows a meanlife 1300 hours and standard deviations of 82 hours. Another random sample of 100 bulbs from company Q showed a mean life 1248 hours and standard deviations of 93 hours. Are the bulbs of company P superior to bulbs of company Q at 5% level of significance?	1	3	8
3.	The mean height of two samples of 1000 and 2000 members are respectively 67.5 and 68.0 inches. Can they be regarded as drawn from the same population with standard deviation 2.5 inches at 5% level of significance?	1	2	8
4.	A Mathematics test was given to 50 girls and 75 boys. The girls made an average grade of 76 with SD of 6, while boys made an average grade of 82 with SD of 2. Test whether there is any significant difference between the performance of boys and girls.	1	2	8

5.	A random sample of 10 boys had the following I.Q's: 70,120,110,101,88,83,95,98,107,100. Do these data support the assumption of a population mean I.Q of 100? Find a reasonable range in which most of the mean I.Q. values of samples of 10 boys lie.	1	2	8
6	A test of the breaking strengths of 6 ropes manufactured by a company showed a mean breaking strength of 3515 kg and a standard deviation of 60 kg, whereas the manufacturer claimed a mean breaking strength of 3630 kg. Can we support the manufacturer's claim at a level of significance 0.05.	1	3	8
7	Two horses A and B were tested according to the time(in seconds) to run a particular race with the following results:	1	2	8

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

Test whether the horse A is running faster than B at 5% level.

8	The following data gives the number of aircraft accidents that occurred during the various days of a week. Find whether the accidents are uniformly distributed over the week.	1	2	8

Days	Sun	Mon	Tue	Wed	Thu	Fri	Sat
No.of accidents	14	16	8	12	11	9	14

9	A group of 10 rats fed on diet A and another group of 8 rats fed on diet B recorded the following increase in weight	1	2	8

Diet A:	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	10	1	2	8		

Find if the variances are significantly different.

10	An instructor has two classes A and B, in a particular subject. class A has 16 students while class B has 25 students. On the same examination,,although there was no significant difference in mean grade class A has standard deviation of 9, while class B had a standard deviation level of 12.Can we conclude at the 0.01 level of significance that the variability of class B is greater than that of class A.	1	2	8

UNIT II

DESIGN OF EXPERIMENTS

One way and two way classifications – Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the basic principles in the design of experiment?	2	1	2
2.	Write down the ANOVA table for one way classification.	2	1	2
3.	State the assumption involved in ANOVA.	2	2	2
4.	State the basic designs of experiment.	2	1	2
5.	Write any two differences between RBD and CRD	2	1	2
6.	What are the advantages of Latin square design.	2	1	2
7.	Discuss the advantages and disadvantages of Randomized block design.	2	2	2
8.	Compare and contrast LSD and RBD.	2	1	2
	PART B			
1.	The following table shows the lives in hours of four brands of electric lamps,	2	3	16

Brand A	1610	1610	1650	1680	1700	1720	1800	
Brand B	1580	1640	1640	1700	1750			
Brand C	1460	1550	1600	1620	1640	1660	1740	1820
Brand D	1510	1520	1530	1570	1600	1680		

Perform an analysis of variance test the homogeneity of the mean lives of the four brands of lamps..

2.	An experiment was designed to study the performance of 4 different detergents for cleaning fuel injectors. The following "cleanliness" readings were obtained with specially designed equipment for 12 tanks of gas distributed over 3 different models of engines	2	3	16

	Engine 1	Engine 2	Engine 3	Total
Detergent A	45	43	51	139
Detergent B	47	46	52	145
Detergent C	48	50	55	153
Detergent D	42	37	49	128
Total	182	176	207	565

Perform the ANOVA and test at 0.01 level of significance, whether there are differences in the detergents or in the engines.

3. Analyze the variance in the Latin Square of yields (in kgs) paddy where P,Q, R, S denote the different methods of cultivation. 2 3 16

S122	P121	R123	Q122
Q124	R123	P122	S125
P120	Q119	S120	R121
R122	S123	Q121	P122

Examine whether the different methods of cultivation have given significantly different yields.

4. A variable trial was conducted on wheat with 4 varieties in a Latin square design.The plan of the experiment and the per plot yield are given below. 2 3 16

Analyse data and interpret the result.

C 25	B 23	A 20	D 20
A 19	D 19	C 21	B 18
B 1	A 14	D 17	C 20
D 17	C 20	B 21	A 15

UNIT III

SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the various methods of solving simultaneous linear equations?	3	1	2
2.	State the Newton-Raphson method formula and condition for convergence.	3	1	2
3.	Distinguish between Gauss elimination method and Gauss seidal method	3	1	2
4.	Write a sufficient condition for Gauss – Seidel method to converge.	3	1	2
5.	Find the dominant Eigen value of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ by power method.	3	1	2
6.	Explain the power method to determine the Eigen value of a matrix.	3	1	2
7.	What kind of an eigenvalue and eigenvector of a matrix would be obtained by Power method.	3	1	2
8.	Explain the term pivot elements.	3	1	2
	PART B			
1.	Find the positive root for the equations given below by Newton-Raphson method.(i) $3x - \cos x = 1$(ii) $x \log_{10} x = 1.2$(iii) $x^4 - x - 9 = 0$	3	5	8
2.	Solve the following system of equations by gauss elimination and gauss Jordan methods (i)10x-2y+3z=23, 2x+10y-5z=-33, 3x-4y+10z=41.(ii) 3x+4y+5z=18, 2x-y+8z=13, 5x-2y+7z=20	3	5	8
3.	Solve, by Gauss-Seidel method, the system of following equations, correct to three decimal places.(i)27x+6y-z=85, x+y+54z=110, 6x+15y+2z=72.(ii) 20x+y-2z=17, 3x+20y-z=-18, 2x-3y+20z=25.	3	5	16
4.	Solve, by Gauss-Jacobi method, the system of following equations, correct to three decimal places.30x-2y+3z=75,x+17y-2z=48,x+y+9z=15	3	5	16
5.	Find the numerically largest Eigen value and the corresponding eigen	3	5	8

vector of (i) $\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$ (ii) $\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$

UNIT IV

INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION

Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivates using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Give the Newton's divided difference interpolation formula.	4	1	2
2.	State Gregory-Newton forward difference interpolation formula.	4	1	2
3.	State any two properties of divided differences.	4	1	2
4.	What is inverse interpolation?	4	1	2
5.	Specify the Newton's backward difference formula for $\frac{dy}{dx}, \frac{d^2y}{dx^2}$.	4	1	2
6.	Write down the errors in Trapezoidal and Simpson's rules of numerical integration.	4	1	2
7.	For using Simpson's 1/3 rule, what is the condition about the intervals.	4	1	2
8.	Give two practical applications of simpson's one third rule.	4	1	2
	PART B			
1.	Using Newton's forward interpolation formula find the polynomial f(x) satisfying the following data. Hence, evaluate y at x=5 X 4 6 8 10 Y 1 3 8 10	4	3	8
2.	Find f(8) by Newton's divided differences formula for the data x 4 5 7 10 11 13 f(x) 48 100 294 900 1210 2028	4	3	8
3.	From the data given below, find θ at x = 43 and at x = 84 x: 40 50 60 70 80 90 θ: 184 204 226 250 276 304	4	5	8

4.	Find the first, second and third derivatives of the function f(x) at x=1.5 X : 1.5 2.0 2.5 3.0 3.5 4.0 f(x) : 3.375 7.0 13.625 24.0 38.875 59.0	4	5	16
5.	Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using Trapezoidal rule and Simpson's 1/3 rule and compare with its exact solution.	4	5	8
6.	Evaluate $\int_1^{1.4}\int_2^{2.4} \frac{1}{xy}dxdy$ by Simpson's rule and Trapezoidal rule. Verify your result by actual integration.	4	5	8

UNIT V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS

Single step methods: Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order differential equations – Multi step methods: Milne's and Adams – Bash forth predictor corrector methods for solving first order differential equations.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the disadvantages of Taylor's series method.	5	1	2
2.	Compute y at x=0.25 by Modified Euler method given $y' = 2xy, y(0) = 1$.	5	1	2
3.	Given y'= -y and y(0)=1, determine the value of y(0.1) by Euler's method	5	1	2
4.	Compare Runge-kutta methods and Predictor-Corrector methods for solution of initial value problem	5	1	2
5.	Write the Milne's Predictor-Corrector formula	5	1	2
6.	What are the different methods of solving an ordinary differential equations ?	5	1	2
7.	What are single step and multistep methods? Give an example	5	1	2
8.	How many prior values are required in Milne's method to predict the next value?	5	1	2

PART B

1.	Compute y(0.1) correct to 4 decimal places if y(x) satisfies y'=x+y , y(0)=1, by Taylor's series method.	5	5	8
2.	Using Euler's method find y(0.2),y(0.4) and y(0.6) from $\frac{dy}{dx} = x + y$, y(0) = 1 with h = 0.2.	5	3	8
3.	Given $\frac{dy}{dx} = y - x^2 + 1, y(0) = 0.5$. Find y(0.2) by modified Euler's Method.	5	3	8
4.	Using R- K method of 4th order , solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ given y(0) = 1 at x = 0.2 , 0.4.	5	3	8
5.	Using Milne's predictor corrector method, find y(4.4) given $5xy' + y^2 - 2 = 0$ given y(4) = 1, y(4.1) = 1.0049 , y(4.2) = 1.0097 , y(4.3) = 1.0143.	5	3	8
6.	Give $\frac{dy}{dx} = x^2(1 + y), y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979$. Find y(1.4) using Adam Bashforth upto four decimals.	5	3	8

----- END ----

GE3251
ENGINEERING GRAPHICS

UNIT I

PLANE CURVES

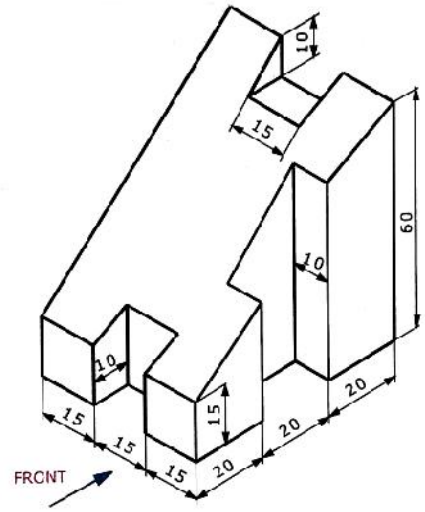
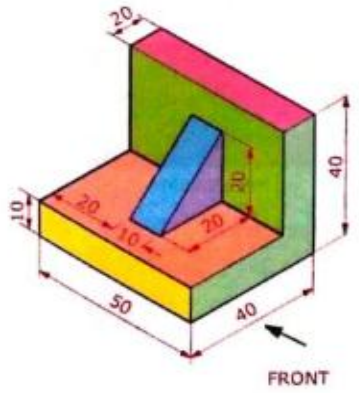
Basic Geometrical constructions, Curves used in engineering practices: Conics — Construction of ellipse, parabola and hyperbola by eccentricity method — Construction of cycloid — construction of involutes of square and circle — Drawing of tangents and normal to the above curves.

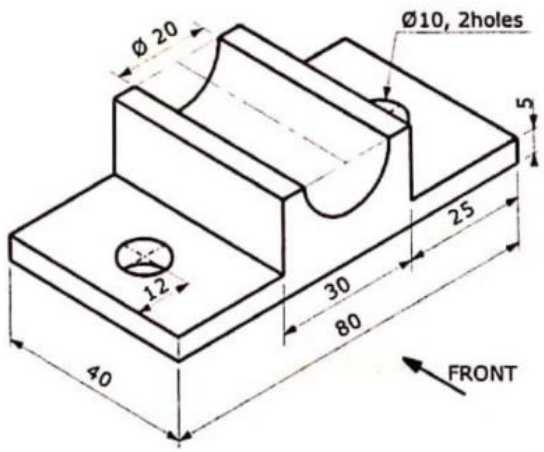
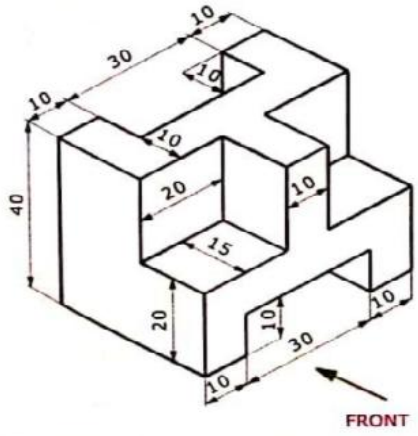
Q.No	Question	CO	BTL	Marks
	PART B			
1.	Construct an ellipse when the distance of the focus from the directrix is equal to 60 mm and eccentricity is 2/3. Draw a tangent and a normal at any point on the ellipse.	1	3	20
2.	Construct a parabola when the distance between focus and the directrix is equal to 60 mm. Draw a tangent and a normal at any point on the parabola.	1	3	20
3	Draw a cycloid for a circle of diameter 60 mm. Also draw the tangent and normal at any point on the curve.	1	3	20
4	Draw an involute of a circle of diameter 50 mm. Also draw the tangent and normal at any point on the curve.	1	3	20
5	Draw an involute of a square of size 40 mm. Also draw the tangent and normal at any point on the curve.	1	3	20
6	Construct a parabola, when the distance between focus and directrix is 50 mm. Also draw a tangent and a normal at a point 60 mm.	1	3	20
7	Draw an involute of a circle of diameter 50 mm. Also construct the normal and tangent at any point M on the curve.	1	3	20

UNIT II

PROJECTION OF POINTS, LINES AND PLANE SURFACE

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces. Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

Q.No	Question	CO	BTL	Marks
	PART B			
1.	A line 70 mm long has one end 15 mm above HP and 30 mm infront of VP. The line is inclined as 35° to HP and 45° to VP. Draw the projections of the line.	2	3	20
2.	A line PQ 75 mm long has its end P 20 mm above HP and 25 mm infront of VP. The end Q is 50 mm above HP and 60 mm infront of VP. Draw the projections and find its inclination with HP and VP.	2	3	20
3	A straight line AB of 50 mm long has its end A 10 mm above HP and the end B 50 mm infront of VP. Construct the projections of line AB if it is inclined at 30° to HP and 45° to VP.	2	3	20
4	Draw the projections of a circular thin plate of diameter 50 mm resting on the ground on a point A on the circumference, its plane inclined at 45° to H.P and plan of the diameter AB making 25° with V.P.	2	3	20
5	Construct the orthographic views of the given component for the given isometric view: (a) Front View (b) Top View (c) Side View 	2	3	20
6	Draw the front, top and side view of the solid shown in fig. 	2	3	20

7	Draw the front, top and side view of the solid shown in fig.  	2	3	20
8	Draw the front, top and side view of the solid shown in fig.  	5	3	20

UNIT III

PROJECTION OF SOLIDS AND FREEHAND SKETCHING

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorial views of objects. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

Q.No	Question	CO	BTL	Marks
	PART B			
1.	Draw the projections of a triangular prism of base side 25 mm and axis 60 mm resting on H.P on one of its base sides with the axis inclined at 40° to H.P and parallel to V.P.	3	3	20
2.	A hexagonal prism of base side 40 mm and axis length 75 mm is resting on H.P. on one of its base sides with its axis inclined at 40° to H.P and parallel to V.P. Draw its projections.	3	3	20
3.	A cylinder of base diameter 50 mm and axis length 70 mm resting on the ground with its axis making an angle of 50° with H.P. Its axis is parallel to V.P. Draw its projections.	3	3	20
4	A cone of base diameter 45 mm and axis length 65 mm is resting on H.P on a point on the circumference of the base. Its base is inclined at 50° with H.P and axis is parallel to V.P. Draw its projections.	3	3	20
5	A hexagonal pyramid of base side 25 mm and axis length 75 mm with rest on one of its base edges on the H.P, with its base inclined at 30° to the H.P and parallel to the V.P. Draw its projection.	3	3	20
6	Draw the projections of a square pyramid of 40 mm side and axis 60 mm long, when it lies on the H.P with its slant edge and axis parallel to V.P.	3	3	20
7	Draw the projection of a pentagonal pyramid of base side 25mm and axis height 60mm with a triangular face perpendicular to H.P	3	3	20
8	A Hexagonal pyramid, side of base 25 mm and axis 55 mm long rests with one of the edges of its base on HP and its axis is inclined at 30° to HP and parallel to VP. Construct its projections.	3	3	20
9	A right circular cylinder of base 50 mm diameter and axis 70 mm long resting with a point of its base circle on HP such that the axis making an angle of 45° with HP and parallel to VP. Construct its projections.	3	3	20

UNIT IV

PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES

Sectioning of above solids in simple vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other — obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids — Prisms, pyramids cylinders and cones. Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

Q.No	Question	CO	BTL	Marks
	PART B			
1.	A hexagonal pyramid of base side 25 mm and altitude 70 mm rests on its base on the H.P with one of its base side parallel to V.P. It is cut by plane perpendicular to V.P and inclined at 35° to H.P and bisecting the axis. Draw the elevation, sectional plan and true shape of the section.	4	3	20
2.	A Cylinder of diameter 48 mm and altitude 55 mm rests on its base on H.P. It is cut by plane perpendicular to V.P and inclined at 45° to H.P. The cutting plane meets the axis at a distance of 16 mm from the top. Draw the elevation, sectional plan and true shape of the section.	4	3	20
3.	A Cone of base diameter 65 mm and axis length 80 mm, resting on the H.P on its base. It is cut by plane perpendicular to V.P and inclined at 45° to H.P and is bisecting the axis. Draw the elevation, sectional plan and true shape of the section.	4	3	20
4	A Cylinder of diameter 50 mm and height 70 mm is resting vertically on one its base on the H.P. It is cut by a plane perpendicular to V.P and inclined at 40° to H.P, and bisecting the axis. Draw the development of the lateral surface of the lower portion of the truncated cylinder.	4	3	20
5	A Square pyramid of base side 50 mm and height 60 mm rests on its base on H.P with two of its base edges parallel to V.P is cut by a plane perpendicular to V.P and inclined at 45° to H.P and intersecting it at a point of distance 40 mm from the base. Draw the development of the pyramid.	4	3	20
6	A hexagonal prism of base side 25 mm and height 65 mm stands with its base on HP such that one of the base edges is parallel to VP. It is cut by a section plane perpendicular to the V.P and inclined at 30° to HP, bisecting the axis. Draw the development of the surface of the cut solid.	4	3	20

7	A hexagonal pyramid side of base 25 mm and altitude 50 mm rests with its base on HP and with two sides of base, parallel to VP. It is cut by a cutting plane inclined at 35° to HP and perpendicular to VP and is bisecting the axis. Draw the front view, sectional plan and true shape of the section.	4	3	20
8	Construct the development of lateral surface of a pentagonal prism, having a base with 30 mm side and a 70 mm long axis, is resting on its base on HP such that one of the rectangular faces is parallel to VP. It is cut by a plane who V.T is inclined at 45° with the reference line and passes through the mid-point of the axis.	4	3	20

UNIT V

ISOMETRIC AND PERSPECTIVE PROJECTIONS

Principles of isometric projection — isometric scale — isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids - Prisms, pyramids and cylinders by visual ray method. Practicing three dimensional modeling of isometric projection of simple objects by CAD Software Not for examination)

Q.No	Question	CO	BTL	Marks
	PART B			
1.	Construct an isometric view of a hexagonal prism having a base with 30 mm side and axis length 70 mm which is resting on its base on HP with an edge of the base parallel to VP.	5	3	20
2.	A square prism of 30 mm side and 50 mm length is kept on the ground plane on one of its rectangular faces in such a way that one of its square faces is parallel to and 10 mm behind the picture plane. The station point is located 60 mm infront of the picture plane and 40 mm above the ground plane. The central plane is 50 mm away from the axis of the prism towards left. Construct the perspective view of the prism.	5	3	20
3	A frustum of cone of bottom diameter 60 mm, top diameter 30 mm and height 40 mm. Draw the isometric view of the frustum.	5	3	20
4	A square pyramid of size 30 mm side and 50 mm axis length is placed centrally on the top of a cube of 50 mm side. Draw the isometric view of the combined solid.	5	3	20

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COMMON TO ALL BRANCHES
SUBJECT TITLE: PH3256 - PHYSICS FOR INFORMATION SCIENCE
SEM/YEAR: I
Question Bank

UNIT I: ELECTRICAL PROPERTIES OF MATERIALS

Classical free electron theory – Expression for electrical conductivity – Thermal conductivity, expression – Wiedemann-Franz law – Success and failures – electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation – Electron effective mass – concept of hole.

PART – A

Q.NO	QUESTION	CO	BTL	Marks
1.	Define mobility of electrons.	1	1	2
2	What are the merits of classical free electron theory?	1	2	2
3.	Write the difference between thermal and electrical conductivity.	1	2	2
4.	State Wiedemann –Franz law.	1	3	2
5.	Define Fermi level and Fermi energy with its importance.	1	2	2
6.	Define density of states. What is its use?	1	4	2
7.	What is Lorentz number?	1	2	2
8.	Define electrical conductivity.	1	1	2

PART – B

1.	Derive an expression for electrical and thermal conductivity of metals.	1	3	16
2.	Derive the expression of density of energy states in metals.	1	3	16
3.	Describe the formation of energy bands in solids based on band theory.	1	3	16

UNIT II: SEMICONDUCTOR PHYSICS

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors – Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carrier transport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

PART – A

Q.NO	QUESTION	CO	BTL	Marks
1	Differentiate between n-type and p-type semiconductors.	**1**	1	2
2	What are the properties of semiconductors?	1	2	2
3	What are the differences between elemental semiconductors and Compound semiconductors?	1	1	2
4	What is Fermi level in a semiconductor?	1	2	2
5	Define Hall-effect and Hall voltage.	1	1	2
6	Mention any four advantages of semiconducting materials.	1	1	2
7	What is an intrinsic semiconductor?	1	1	2
8	What is an n-type semiconductor?	1	1	2

PART – B

1.	What is Hall Effect? Derive an expression for Hall coefficient. Describe an experimental setup for the measurement of the hall coefficient and mention its applications.	4	2	16
2.	Describe the construction and working of Schottky Diode and Ohmic contact with neat diagrams.	4	2	16
3.	Derive an expression for the carrier concentrations of electron and holes in an intrinsic semiconductor. And also explain the variation of carrier concentration with temperature	4	2	16
4	Derive an expression for carrier concentration of p-type and n-type semiconductor.	4	2	16

UNIT III: MAGNETIC PROPERTIES OF MATERIALS

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility – Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

PART – A

Q.NO	QUESTION	CO	BTL	MARKS
1.	Define diamagnetism	5	1	2
2	State the properties of hard magnetic materials.	5	2	2
3.	On the basic of spin how the materials are classified as para, ferro, antiferro and ferrimagnetic.	5	1	2
4.	What is Bohr magneton?	5	4	2
5.	State the applications of ferrites.	5	1	2
6.	What is domain theory of ferromagnetism?	5	1	2
7.	What are soft- magnetic materials?	5	1	2
8.	What is antiferromagnetism?	5	1	2

PART – B

1.	Describe (classify) dia, para, ferro, antiferro and ferrimagnetic materials and their properties with example	5	4	16
2.	Explain about the origin of ferromagnetism and exchange interaction in ferromagnetic materials.	5	2	16
3.	Explain Magnetic principle in computer data storage and GMR sensor	5	4	16
4	Compare the different types of magnetic materials and mention their properties and application.	5	2	16

UNIT IV: OPTICAL PROPERTIES OF MATERIALS

Classification of optical materials – carrier generation and recombination processes – Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) – photo current in a P-N diode – solar cell – LED – Organic LED – Laser diodes – Optical data storage techniques.

PART – A

Q.NO	QUESTION	CO	BTL	MARKS
1.	Define carrier generation and recombination.	5	1	2
2	What are advantages of optical disc?	5	2	2
3.	What is photo diode?	5	1	2
4.	What is the basic principle of LED and OLED?	5	4	2
5.	Define photoelectric effect.	5	1	2
6.	State the appilications of laser diode.	5	1	2
7.	Give the principle of solar cell.	5	1	2
8.	What are the advantages of OLED over LED ?	5	1	2

PART – B

1.	Explain the principle, construction and working of (i). Semiconductor diode laser with necessary diagrams. (ii). Photocurrent in P-N diode and solar cell	5	4	16
2.	Explain the principle and working of LED and OLED with a neat diagram.	5	2	16
3.	Explain the three types of carrier generations and recombination in semiconductors.	5	4	16
4	Explain absorption and emission of light in metals, insulators and semiconductor	5	2	16

UNIT V: NANODEVICES AND QUANTUM COMPUTING

Introduction – quantum confinement – quantum structures: quantum wells, wires and dots — band gap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade – resonant-tunneling diode – single electron transistor – quantum cellular automata – Quantum system for information processing – quantum states – classical bits – quantum bits or qubits –CNOT gate – multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.

PART – A

Q.NO	QUESTION	CO	BTL	MARKS
1.	Define Nano materials.	5	1	2
2	What are the Nano devices?	5	2	2
3.	Define coulomb blockade.	5	1	2
4.	What is quantum well?	5	2	2
5.	List out the advantages of quantum computing over classical computing.	5	1	2
6.	Define quantum dots	5	1	2
7.	State the properties of Carbon Nanotubes	5	1	2
8.	What are the applications of carbon nanotubes	5	1	2

PART – B

1.	Explain Quantum confinement and quantum structures in nano materials.	5	4	16
2.	Describe single electron phenomena and single electron transistor.	5	2	16
3.	Explain in detail about tunneling process and also give an account on resonant tunneling diode with neat diagram.	5	4	16
4	Briefly explain (i) Quantum system for information processing, (ii). Quantum states, (iii). Classical bits, (iv). Quantum bits	5	2	16