Code No. 61

FACULTY OF ENGINEERING

B.E. 2/4 (Civil) II – Semester (Suppl.) Examination, December 2017

Subject: Strength of Materials – II

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Explain the concept of shear center. 2

2 Define static indeterminacy. 2

3 If the thickness of plates in a semi-elliptical laminated spring is reduced to half, what happens to the maximum bending stress induced in the spring? 2

4 A simply supported beam carries a point load at its center. If the flexural rigidity is doubled, what is its effect on deflection? 2

5 If crushing load of steel column (E = 2×10^5 Mpa) is 1500 kW, find the Rankine's constant. 2

6 What is the theorem of reciprocal deflection? 3

7 If in a fixed beam, one of the supports sinks by an amount '¢', what are the resultant fixed end moments developed? Sketch the directions of fixed end moments. 3

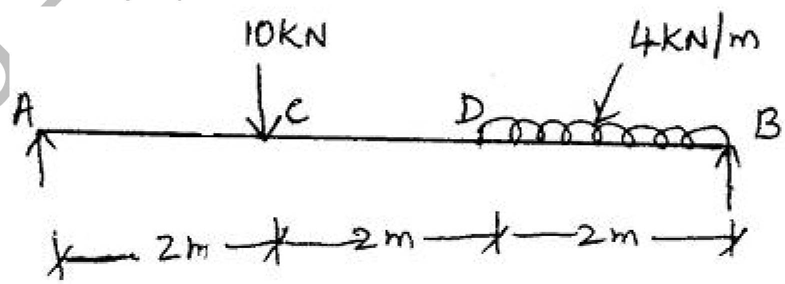
8 Differentiate between symmetrical bending and unsymmetrical bending with an example. 3

9 State and explain Mohr's theorems under Moment Area method. 3

10 Write the equivalent lengths for the four standard cases of end conditions of column. 3

PART – B (5x10 = 50 Marks)

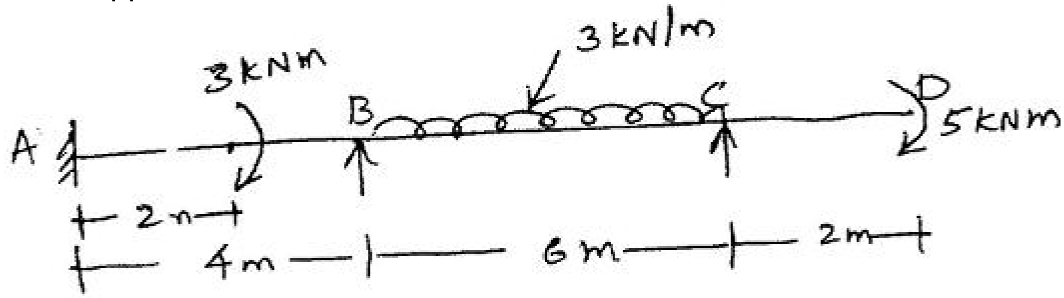
11 A simply supported beam of 6 m san is loaded as shown. Evaluate the maximum slope and deflection if EI = 15×10^9 KN-mm^2. 10



12 A cantilever 6 m long is fixed at the left support and propped by a rigid prop at 1 meter from the free end. It is subjected to a udl of 2 kN/m over the entire span and a point load of 4 kN at the free end. Calculate the Prop reaction and draw SFD and BMD if EI = 1×10^3 KN/m^2. 10

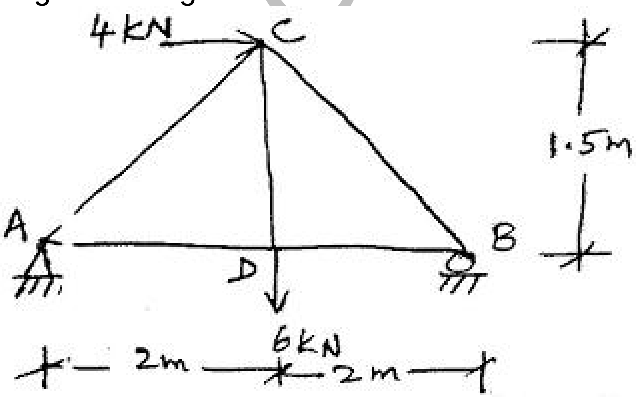
13 A hollow cast iron column 200 mm external diameter and 20 mm thickness is 5 m long and fixed at both the ends. It is subjected to a load of 120 kN at an eccentricity of 10 mm. Find max. and min. stresses induced in the section. Also evaluate the max. permissible eccentricity so that no tension occurs anywhere in the section. EI = 120 KN-mm^2. Use secants formula. 10

14 Evaluate support moments and draw BMD for the continuous beam shown in Fig. 10



15 A close coiled helical spring of 8 mm dia wire has spring diameter 60 mm and number of coils 10. Calculate the increase in number of coils and the bending stress induced in the section of the spring if an axial moment of 8 Nm is applied to the spring. Take $E = 2.1 \times 10^5$ N/mm^2. Find also the torsional stiffness of the spring. 10

16 Using tension coefficient method evaluate the magnitude and nature of forces in the members of the truss given in Fig. 10



17 a) A steel bar 20 mm diameter is subjected to an axial tensile load of 10 kN. It is 250 mm long. Calculate modulus of resilience and the total strain energy stored in the bar. 5

b) Indicate the shear flow directions in an I-section and a T-section with web kept in the horizontal and vertical directions both. 5

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Code No. 67

FACULTY OF ENGINEERING

B.E 2/4 (EEE) II – Semester (Suppl.) Examination, December, 2017

Subject : Electrical Circuits - II

Time : 3 Hours **Max Marks : 75**

Note: Answer all questions from Part – A & Any five questions from Part – B.

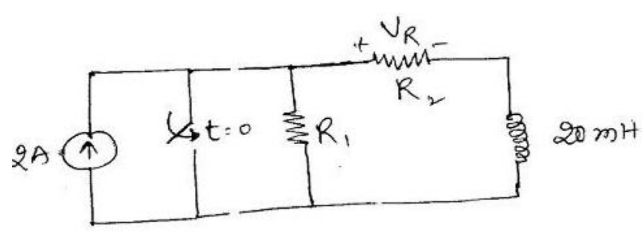
Part – A (25 MARKS)

1. Derive the expression for current response of source free RL series circuit 3
2. Write the properties of Laplace Transforms 3
3. A Two – port network is characterized by the equations
   $4\ V_1 + 3I_1 - 2I_2 = 0$ and $8I_1 - 6I_2 – 2V_1 + 3V_2 = 0$. Find open circuit parameters. 4
4. Obtain the Laplace Transform of RC series circuit for unit step input. 3
5. A step voltage of V = 5 u (t-3) is applied in a series RL circuit. Find the current response if R = 10Ω and L = 0.1 H. 3
6. Define symmetries in electrical circuits. 3
7. Write the significance of Network functions. 3
8. Write the properties of positive Real functions. 3

PART-B Marks: (50 Marks)

9. An AC voltage of $V = V_m \sin (5005t)$ is applied to a series RL circuit with R = 10Ω and L = 0.1 H, Calculate the ratio of maximum value to which the current rise to the steady state maximum value when the voltage is applied at an instant t = 0 .002 sec. 10

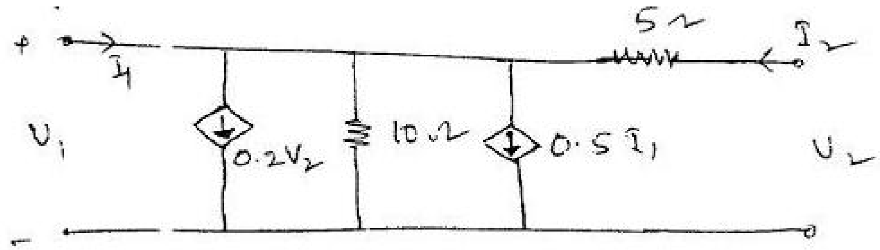
10. The switch in the circuit is open for a long time and is closed at t = 0.Find the values of R_1 and R_2 in the circuit if $V_R(0^+) = 10V$ and V_R (1msee) = 5V. 10



11. A ramp voltage V = 2r (t-2) is applied in a series RC circuit at t =0 where R = 5Ω and C = 0.01F. Find i(t) assuming zero initial conditions. 10

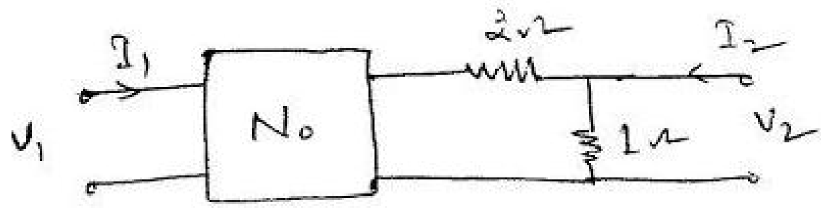
12. a) Find short circuit parameters for the following two – port network. 5

b) Prove that $AD - BC = 1$ for transmission parameters. 5

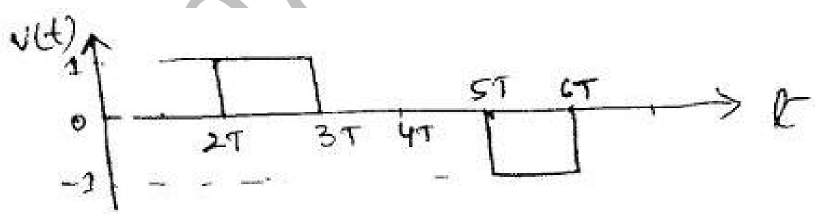


13. In the arrangement of figure given below find Z- Parameters. 10

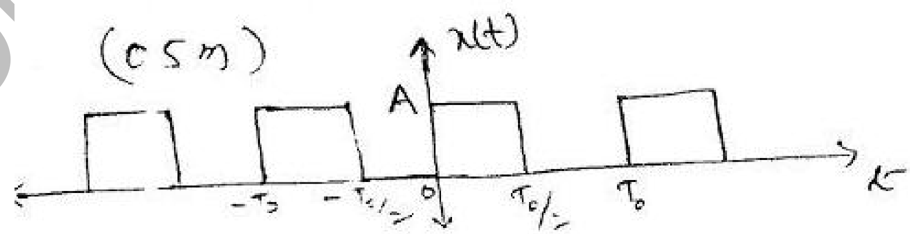
$$\begin{bmatrix} V_1 \\ I_1 \end{bmatrix} = \begin{bmatrix} 30 & 23 \\ 13 & 10 \end{bmatrix} \begin{bmatrix} V_2 \\ -I_2 \end{bmatrix}$$



14. a) Find the Laplace transform of the following signal. 5



b) Find the fourier series expansion of the following signal. 5



15. a) Synthesize the impedance function

Z (s) = $\dfrac{s(s^2+4)}{2(s^2+1)(s^2+9)}$ Using Foster forms of realization. 5

b) Write all the properties of Hurwitz polynomial and test for Hurwitz of the following polynomial $P(s) = s^6 + s^5 + 3s^4 + 6s^3 + 3s^2 + 2s + 2$. 5

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Code No. 74

FACULTY OF ENGINEERING

B.E 2/4 (Inst.) II – Semester (Suppl) Examination, December, 2017

Subject : Transducer Engineering

Time : 3 Hours **Max Marks : 75**

Note: Answer all questions of Part – A & Any five questions from Part – B.

PART – A (25 MARKS)

1. Identify the differences between measurement and Calibration 2
2. A temperature transducer has a range 0-100^{o}C and an accuracy of 0.6% of full scale reading. Determine the error for a reading of 55^{o}C. 3
3. Write about the basic requirement of transducers. 2
4. Mention at least four applications of strain gauges. 2
5. Discuss the principle of capacitive proximity sensor. 3
6. Discuss the principal of variable inductive transducer. 3
7. State the principal of bimetallic strip thermometer. Give its range of measurement. 3
8. Write the general mathematical model of Resistance Temperature Detectors. 2
9. Using suitable representation indicate Gauge. Vacuum, Atmospheric and absolute pressure. 3
10. A McLeod gauge has volume of bulb, capillary and tube down to its opening equal to 90 cm^3 and a capillary diameter of 1mm. Calculate the pressure indicated by a reading of 3cm. 2

PART-B Marks: (50 Marks)

11. Explain the various "Static Characteristics of measuring Systems" 10

12. Find the ramp response for the first order system given

$$T(s) = \frac{5}{1+2.5}$$

Also find the steady state error for the response. 10

13. Prove that the gauge factor of a metallic strain gauge is

$$G = 1 + 2¥ + \frac{\nabla\circ}{\circ\ \in} \qquad 10$$

Also comment on the Gauge factor of semiconductor Strain gauge

14 Explain the operating principle with construction of variable capacitance transducer with varying distance and dielectric constant. 10

15 a) Discuss the means for the calibration of Temperature measurement. 5
b) Explain the laws use to study the behavior of thermocouple 5

16. Explain the classification of pressure transducer for medium, high and low pressure measurement. 10

17. With short notes on: 10
a) LVDT b) Elements for pressure measurement
c) ICs for temperature measure me

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Code No. 78

FACULTY OF ENGINEERING

BE. 2/4 (ECE) II – Semester (Supply) Examination, December- 2017

Subject: Probability Theory & Stochastic Processes

Time: 3 Hours **Max. Marks: 75**

Note: Answer all Questions from Part A and any Five Questions from Part B

PART – A (25 Marks)

1 If 4 of 25 electrical cables are defective and 5 of them are randomly chosen for inspection, What is the probability that only one of the defective cable will be included (3)

2 For the given continuous probability density function $f(x) = kx^2e^{-x}$ is a density function, when $x \geq 0$, Find the value of k. (3)

3 A continuous Random Variable x has pdf $f(x) = \frac{3}{4}x(2-x)$, $0 \leq x \leq 2$. Find $E[X]$. (3)

4 The joint pdf of (x,y) is given to be (3)

$f(x, y) = Ae^{-x-y}$ for $0 \leq x \leq y, 0 \leq y \leq \infty$

$= 0$ Otherwise Find A.

5 State chebychev's inequality. (2)

6 What is the probability that a leap year contains 53 Sundays? (2)

7 A continuous RV x has pdf $f(x) = 2e^{-2x}$ if $x > 0$. Find $P\{1 < x < 3\}$

$= 0$ Otherwise. (3)

8 Two unbiased dice are thrown. Find the expected value of the sum of the number of points on them (3)

9 Determine whether the constant process ª $(t) = A$, Where A is a random variable with mean $\overline{A}$ and variance $\pm_A^2$ is mean ergodic. (3)

PART- B (50 MARKS)

11 a) Companies B_1, B_2 and B_3 produces 30%, 45% and 25% of the cars respectively. It is known that 2%, 3% and 2% of these cars produced from B_1, B_2 and B_3 are defective
i) What is the probability that the car purchased is defective
ii) If the purchased is defective, What is the probability that this car is produced by company B_1 (5)

b) An intercom system master station provides music to 6 hospital rooms. The probability that any one room will be switched ON and draw power at any time is 0.4. When ON, a room draw 0.5W. Find and plot the density and distribution functions for the random variable "Power delivered by the master station". (5)

12 a) Consider a Random Variable with exponential density, Find the characteristic function and moment generating function. (5)

$$f(x) = \frac{1}{b} e^{-(x-a)/b} \quad x \geq a$$
$$= 0 \quad x < a$$

b) A Random Variable x is uniformly distributed on the interval (-5,-15). Another Random Variable $y=e^{-x/5}$ is formed. Find mean and variance of y. (5)

13 a) The joint probability of density two random variables x and y is

$$f_{xy}(x,y) = 1 \quad -1/2 < x < 1/2 \text{ and } -1/2 < y < 1/2$$
$$= 0 \text{ Elsewhere}$$

b) x and y are two random variables whose joint density is given by

$$f_{xy}(x,y) = \frac{xy}{9}, \; 0 < x < 2 \text{ and } 0 < y < 3$$
$$0 \text{ elsewhere}$$

Show that x and y are statistically independent (5)

14 a) State and prove Central Limit Theorem (5)

b) Find the correlation coefficient between two random variables x and y if $E[x] = 4$, $E[y] = 9$, $E[xy] = 100$, $E[x^2] = 81$, $E[Y^2] = 256$ (5)

15 a) Consider a random process $x(t) = A_0\cos(w_0t+¯)$ Where A_0 and w_0 are constants and Ɵ is a uniform random variable in the interval (0, ∏). Find

i) Whether x (t) is WSS process or not ii) Find the PSD of x (t) (6)

b) State and prove the properties of cross correlation function (4)

16 a) For a stationary erogdic process with periodic components, the Autocorrelation function is $R_{xx}(t) = 36 + \frac{4}{1+5t^2}$ Find Mean and Variance of process x(t). (5)

b) Find the autocorrelation function of the process x (t) whose PSD is (5)

$$S_{xx}(w) = 1 + w^2 \quad |W| \le 1$$
$$0 \quad |W| > 1$$

17 a) An unbiased coin is tossed 4 times. If x denotes the number of heads from the distribution of x by writing down all possible outcomes, calculate the variance of the random variable x. (5)

b) The joint probability of density two random variables x and y is given by

$$f_{xy}(x, y) = \frac{1}{2} \quad 0 \le x \le y \text{ and } 0 \le y \le 2$$

Determine i) Conditional pdf's f(x/y) and f(y/x) ii) Marginal densities of x and y (5)

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Code No. 89

FACULTY OF ENGINEERING

B.E. 2/4 (M/P/AE/CSE) II - Semester (Suppl.) Examination, December 2017

Subject : Mathematics - IV

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions from Part-A and answer any five questions from Part-B.

PART – A (25 Marks)

1 Find the points where the Cauchy-Riemann equations are satisfied for the function $f(z) = z\bar{z}$. (3)

2 Verify that the function $u = e^{-x}(x \sin y - y \cos y)$ is harmonic. (2)

3 Expand $f(z) = \cosh z$ in Taylor's series about $z = \pi i$. (3)

4 Find the image of $|z| < 1$ under the transformation (2)

$$w = \frac{1+iz}{1-iz}$$

5 If $Z\{f_n\} = F(z)$, prove that $Z\{a^n f_n\} = F\left(\frac{z}{a}\right)$, where a is a constant. (3)

6 Find the Z transform of the sequence $\left\{\frac{2^n e^{-n}}{n!}\right\}$. (2)

7 Obtain the Fourier cosine transform of $f(x) = \frac{e^{-x}}{x}$. (3)

8 State and prove the linearity property of Fourier transforms. (2)

9 Using two iterations of Newton-Raphson method, find an approximate value of $\sqrt[3]{101}$. (3)

10 Construct the backward difference table for the data. (2)

x	-4	-2	0	2	4	6
f(x)	261	19	1	15	253	1291

PART – B (50 Marks)

11 (a) If f(z) is analytic and |f(z)| is constant in a domain D, then show that f(z) is constant in D. (5)

(b) State and prove Cauchy's integral theorem. (5)

12 (a) Find all possible Laurent series expansions of $f(z) = \frac{1}{(1-z)(z-2)}$ about z = 0. (5)

(b) Evaluate $\oint \frac{dz}{z^4+1}$, where C is |z-1|=1 using residue theorem. (5)

13 (a) State initial value theorem and hence find f_0, f_1, f_2 in the sequence $\{f_n\}$ if $Z\{f_n\} = \frac{z}{z^2+1}$. (5)

(b) Solve the difference equation $y_{n+2} + 5y_{n+1} + 6y_n = 0$, $y_0=1$, $y_1=1$ using Z transforms. (5)

14 (a) Find the Fourier cosine integral of $f(x) = e^{-ax}$. Hence, find the value of the integral

$$\int_0^{\infty} \frac{\cos px}{1+p^2}\, dp$$ (5)

(b) Find the finite Fourier sine and cosine transforms of $f(x) = x$ in $(0, \pi)$. (5)

15 (a) Use bisection method to compute the root of the equation $\tan x + x = 0$ which lies between 2 and 2.1 correct to two decimal places. (5)

(b) Using the following data, find the value of x for which y is minimum (5)

x	0	2	4	6
y	3	3	11	27

16 (a) If $f(z)=u+iv$ is analytic, show that (5)

$$\left[\frac{\partial}{\partial x}\,|f(z)|\right]^2 + \left[\frac{\partial}{\partial y}\,|f(z)|\right]^2 = |f'(z)|^2$$

(b) Evaluate $\int_0^{2\pi} \frac{d\theta}{\sqrt{2}-\cos\theta}$. (5)

17 (a) Find the inverse Z transform of $F(z) = \dfrac{z^3+z}{(z-2)^2(z+3)^2}$. (5)

(b) Use Runge-Kutta method of order 4 to find an approximate value of y(0.2) for $y' = x + y^2$, $y(0)=1$. (5)

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Code No. 93

FACULTY OF INFORMATICS

B.E. 2/4 (IT) II-Semester (Supplementary) Examination, December 2017

Subject : Probability and Random Processes

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 If the events A and B are independent, show that $\overline{A}$ and $\overline{B}$ are also independent. 2
2 A and B alternately throw a pair a dice. A wins if he throws 6 before B throws 7, and B wins if he throws 7 before A throws 6. If A begins, find the probability of A winning the game. 3
3 The four central moments of a distribution are 0, 2.5, 0.7 and 18.75. Comment on the nature of the distribution. 3
4 State the properties of characteristic function. 2
5 If X and Y are independent random variables then show that E(Y/X) = E(Y). 3
6 Write the joint p.d.f. of r.v.(X,Y). 2
7 Define mean ergodic process. 3
8 State Weiner-Khinchine theorem. 2
9 Define Guassian process and state its properties. 2
10 Define band-limited white noise and state its properties. 3

PART – B (50 Marks)

11 a) State and prove Baye's theorem. 3
b) A company produces chips in two plants (Plant I and Plant II) with a daily production of 1500 and 2000 respectively. The fraction defective of chips produced by Plant I and Plant II are 0.006 and 0.008 respectively. If a chip selected at random from the day's production is found to be defective, what is the probability that it came from Plant I. 7

12 a) For a distribution mean is 10, variance is 16, γ_1= and $\beta_2 = 4$. Obtain the first four moments about origin. 4
b) For a certain binary communication channel, the probability that a transmitted 0 is received as a 0 is 0.95 and the probability that a transmitted 1 is received as 1 is 0.90, if the probability that a 0 is transmitted is 0.4, find the probability that i) a 1 is received ii) a 1 was transmitted given that a 1 was received. 6

13 a) Define cumulative distribution function of a two dimensional random variable (X, Y). State its properties. 4
b) The joint p.d.f. of r.v.(X,Y) is given by $f(x,y) = k\,x\,y e^{-(x^2+y^2)}\; x > 0, y > 0$. Find the value of k and prove that X and Y are independent. 6

14 a) Define cross-correlation and state its properties. 4

b) Show that spectral density and the autocorrelation function of a real SSS process form a Fourier Cosine transform pair. 6

15 a) Find the mean and auto-correlation of Poisson process. 4

b) Suppose that customer arrive at a bank according to a Poisson process with mean rate of 3 per minute. Find the probability that during a time interval of 2 minutes i) exactly 4 customers arrive ii) more than 4 customers arrive. 6

16 a) Find the power spectral density of a WSS process with autocorrelation function $R\left(^{2}\right) = e^{-a^{2}\,^{2}}$. 4

b) A continuous random variable has the p.d.f. $f(x) = \frac{1}{2}x^2 e^{-x}$ for $x \geq 0$. 6

17 a) Show that the random process $X(t) = A \operatorname{Cos}(\omega_0 t+\theta)$ where θ is a random variable and $\theta \sim U(0,2\pi)$ is a WSS process. 5

b) Verify whether the sine wave process $\{X(t)\}$ where $X(t) = Y \operatorname{Cos} \omega t$ where $Y \sim U(0,1)$ is a SSS process. 5

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Code No. 16

FACULTY OF ENGINEERING

BE. II – Semester (Supply) Examination, December 2017

Subject: Engineering Physics - II

Time: 3 Hours **Max. Marks: 70**

Note: Answer all Questions from Part A and any Five Questions from Part B

PART – A (2 x 10 = 20 Marks)

1 Define the crystal lattice, basis and crystal structure.

2 Calculate the root mean square velocity of the electron at $27^{o}C$ on the basis of classical free electron theory (Note : K = 8.6×10^{-5} eV/k, m=9.1×10^{-31} Kg).

3 Distinguish between the type I and type II superconductors.

4 Define the terms (i) retentivity (ii) coercivity

5 Mention the uses of thermistor.

6 A solar cell having fill factor 0.6 gives the maximum power output of 18×10^{-3} Watts and V_{oc} = 300 mV. Calculate its I_{sc}.

7 7Explain the Quantum treatment of Raman effect.

8 Write the magnetic properties of the nano particles.

9 Explain classification of nano materials.

10 Explain the space charge polarization.

PART – B (5x 10 = 50Marks)

11. a) Describe the qualitatively theory of Kronig – Penny model and what are the conclusions can be drawn from it. 5

b) Obtain expression for the equilibrium concentration of Schottkydefects inionic crystals. 5

12. a) Explain the Weiss molecular field theory of ferromagnetic materials. 5

b) Describe the preparation of high T_c superconductors. 5

13. a) Deduce an expression for Fermi – level in n-type semiconductor. 5

b) Describe the experimental determination of dielectric constant of dielectric by Schering method. 5

14 a) Explain the principle and working of atomic force microscopy. 5

b) Explain the working and V-! characteristic of solar cell. 5

15 a) Describe the chemical vapour deposition for preparation of nano particles. 5

b) Distinguish between the top - down and bottom – up process of nano materials. 5

16 a) Describe the line defects and surface defects. 5

b) Distinguish between the soft and hard magnetic materials. 5

17 a) How many types of dielectric polarisation and Explain the ionic polarisation. 5

b) What are the applications of the ferrites materials? 5

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