

Register Number:

PART - III

PHYSICS MODEL QUESTION -3

Time Allowed: 03:00 Hours]

Maximum Marks: 150]

Instructions:

- i) Check the Question Papers for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
- ii) Use **Black or Blue ink** to write and **Pencil** to draw diagrams.

Part - I

Note: (i) Answer all the questions

(30 X 1 = 30)

(ii) Choose the correct answer

(iii) Each question carries one mark.

- 1) The unit of permittivity is
a) $C^2N^{-1}m^{-2}$ b) $N m^2C^{-2}$ c) $H m^{-1}$ d) $N C^{-2}m^{-2}$
- 2) An electric dipole placed in a uniform electric field experiences
a) Attractive force b) repulsive force c) a torque d) net force
- 3) Force between two charges is 0.5 N if the distance between them is doubled then the force between them will be
a) 1N b) 0.125 N c) 0.20 N d) 0.25N
- 4) The electric field outside the plates of two oppositely charged parallel plates of area A and charge Q is
a) $\sigma/2\epsilon_0$ b) $-\sigma/2\epsilon_0$ c) σ/ϵ_0 d) zero
- 5) The brown ring at one end of a carbon resistor indicates a tolerance
a) 1% b) 2% c) 5% d) 10%
- 6) 5 ampere of current flowing through a resistor for two minutes produces 3000 J of heat. The value of the resistance is
a) 1 Ω b) 4 Ω c) 2 Ω d) 40 Ω
- 7) Peltier effect is the converse of
a) Joule effect b) Raman Effect c) Thomson effect d) Seebeck effect
- 8) The generator rule is
a) Fleming's left hand rule b) Fleming's right hand rule
c) Maxwell's right hand cork screw rule d) Right hand palm rule
- 9) The self inductance of a straight conductor is
a) Zero b) infinity c) very large d) very small
- 10) In LCR circuit when $X_L = X_C$ the current
a) Zero b) in phase with voltage
c) leads the voltage d) lags behind the voltage
- 11) A D.C of 5A produces the same heating effect as an A.C. of
a) 50A rms current b) 5A rms current c) 5A peak current d) none

30. A transformer has an efficiency of 80%. It is connected to a power input of at 4 kW and 100V. If the secondary voltage is 240 V, calculate the primary and secondary currents

(Or)

A coil is connected across 250 V, 50Hz power supply and it draws a current of 2.5 A and consumes power of 400 W. Find the self inductance and power factor.

56. State and prove Brewster's law.
57. Calculate the distance of closest approach of α particles to the copper nucleus when α particles of 5 MeV are scattered back by a thin sheet of copper (Z for copper 29)
58. Derive an expression for de Broglie wavelength for electron
59. Derive Einstein's mass energy equivalence
60. Obtain an expression to deduce the amount of the radioactive substance present at any instant
61. State and prove De Morgan's theorems.
62. What are the advantages and disadvantages of digital communication?

PART-D

Note: (i) Answer any four questions in detail.

(4 X 10 = 40)

(ii) Draw diagram whenever necessary.

63. Derive an expression for the electric field due to an electric dipole at a point on its equatorial line.
64. Explain in detail the principle, construction and theory of tangent galvanometer.
65. Discuss with theory the method of inducing emf in a coil by changing its orientation with respect to the direction of magnetic field.
66. Derive an expression for bandwidth of interference fringes in Young's double slit experiment.
67. Draw a neat sketch of He - Ne laser. Explain its working with the help of energy level diagram.
68. Discuss the principle and action of a Bainbridge mass spectrometer to determine the isotopic masses.
69. What is rectification? Explain the working of bridge rectifier.
70. With the help of block diagram explain the function of a monochrome TV transmission.

- 12) The blue colour of the sky is due to the scattering of-----
of the solar spectrum
a) Shorter wavelengths b) longer wavelengths
c) all the wavelengths d) none
- 13) In a plane diffraction grating the unit of grating element is
a) no unit b) metre c) metre⁻¹ d) degree
- 14) The refractive index of the medium for the polarizing angle 60° is
a) 1.732 b) 1.414 c) 1.5 d) 1.469
- 15) Of the following which one is a uniaxial crystal?
a) mica b) aragonite c) topaz d) quartz
- 16) The ratio of the areas enclosed by first three Bohr orbit is
a) 1 : $\frac{1}{2}$: $\frac{1}{3}$ b) 1:2 :3 c) 1: 4: 9 d) 1 :16 :81
- 17) According to Bohr "postulates which of the following quantities take discrete values?
a) kinetic energy b) potential energy
c) angular momentum d) momentum
- 18) If the total charge on oil drop in Millikan's oil drop experiment is $17.622 \times 10^{-19} \text{C}$ then the total number of electrons in the oil drop will be
a) 10 b) 11 c) 12 d) 13
- 19) In Sommerfeld atom model for a given value of n, the number of values / can take is
a) n b) n +1 c) n-1 d) 2n+1
- 20) The mass of a particle moving with velocity equal to that of light becomes
a) Zero b) negative c) positive d) infinity
- 21) The work function of a metal is $6.626 \times 10^{-19} \text{J}$. The threshold frequency is
a) $1 \times 10^{15} \text{Hz}$ b) $10 \times 10^9 \text{Hz}$ c) $1 \times 10^{15} \text{Hz}$ d) zero
- 22) The binding energy of ${}_{26}\text{Fe}^{56}$ nucleus is
a) 8.8 MeV b) 88 MeV c) 493 MeV d) 41.3 MeV
- 23) The moderator used in nuclear reactor is
a) cadmium b) boron carbide c) heavy water d) uranium
- 24) Half life of ${}_{7}\text{N}^{13*}$ is
a) 3 minutes b) 10.1 minutes c) 13 minutes d) 5570 years
- 25) Average energy of thermal neutrons is about
a) 0.025 eV b) 0.25 eV c) 2.5 eV d) 2 MeV
- 26) The forbidden energy gap for silicon is of the order of
a) 1.1 eV b) 0.7 eV c) 0.3 eV d) 10 eV
- 27) According to Boolean algebra the expression $A + A \cdot B$ is equal to
a) A b) AB c) BA d) ABC
- 28) For a transistor $\beta = 49$ its α value is
a) 49 b) 1.02 c) 0.98 d) 9.8
- 29) In amplitude modulation the band width is
a) equal to the signal frequency b) twice the signal frequency
c) thrice the signal frequency d) four times the signal frequency
31. Troposphere extends up to
a) 5 km b) 15 km c) 60 km d) 90 km

PART-B

Note :i) Answer any fifteen questions.

(15X3 = 45)

ii) Each answer should be in one or two sentences.

32. Why is it safer to be inside a car than standing under a tree during lightning?
33. Two charges $10 \times 10^{-9} \text{C}$ and $20 \times 10^{-9} \text{C}$ are placed at a distance of 0.3m apart. Find the potential at a point mid way between them.
34. Define drift velocity. Give its unit
35. How much time 10^{20} electrons will take to flow through a point, so that the current is 200 mA?
36. State Faraday's laws of electrolysis
37. Define ampere.
38. Write the equation of a 25 cycle current having rms value of 30A.
39. Define quality factor.
40. Distinguish between corpuscles and photons.
41. Give any three uses of Polaroid's.
42. Find the minimum wavelength of X rays produced by an X ray tube at 1000 kV.
43. Define wave number. Give its unit.
44. Mention the limitations of electron microscope.
45. Define curie.
46. What is meant by pair production and annihilation?
47. What are the advantages of negative feedback?
48. Give the Barkhausen criteria for oscillators
49. When the negative feedback is applied to an amplifier of gain 50, the gain after feedback falls to 25. Calculate the feedback ratio.
50. What are universal gates? Why are they called so?
51. Define modulation factor

PART- C

Note:(i) Answer question No.55 is Compulsory.

(7 X 5 = 35)

(ii) Answer any six questions from the remaining 11 questions.

(iii) Draw diagram wherever necessary.

52. Prove that energy stored in a parallel plate capacitor is $q^2/2C$
53. In a house electric kettle of 1500 W is used every day for 45 minutes to boil water. Find the amount payable per month (30 days) for usage of this if cost per unit is `3.25.
54. Explain the resistors connected in parallel.
55. Deduce an expression for force produced on a current carrying conductor placed in a magnetic field.