

Register Number:

PART - III

PHYSICS MODEL QUESTION - 1

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 01 = 30)
 (ii) Choose the correct answer
 (iii) Each question carries one mark.

1. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences
 - a. only a net force
 - b. only a torque
 - c. both a net force and torque
 - d. neither a net force nor a torque
2. The unit of permittivity is
 - a. $\text{NC}^{-2}\text{m}^{-2}$
 - b. Hm^{-1}
 - c. $\text{C}^2\text{N}^{-1}\text{m}^{-2}$
 - d. Nm^2C^{-2}
3. The number of lines of force that radiate outwards from one coulomb charge is
 - a. 1.13×10^{11}
 - b. 8.85×10^{11}
 - c. 9×10^9
 - d. infinite
4. On moving a charge of 20 C by 2 cm, 2J of work is done, then the potential difference between the points is
 - a. 0.5 V
 - b. 0.1 V
 - c. 8 V
 - d. 2 V
5. In the case of insulators, as the temperature decreases, resistivity
 - a. increases
 - b. decreases
 - c. becomes zero
 - d. remains constant
6. In a tangent galvanometer, for a constant current, the deflection is 30° . The plane of the coil is rotated through 90° . Now, for the same current, the deflection will be
 - a. 0°
 - b. 30°
 - c. 60°
 - d. 90°
7. In a thermocouple, the temperature of the cold junction is 20°C , the temperature of inversion is 520°C . The neutral temperature is
 - a. 500°C
 - b. 540°C
 - c. 270°C
 - d. 510°C
8. Electromagnetic induction is not used in
 - a. transformer
 - b. room heater
 - c. AC generator
 - d. choke coil
9. Which of the following devices does not allow D.C. to pass through?
 - a. resistor
 - b. capacitor
 - c. inductor
 - d. all the above
10. The unit Henry can also be written as
 - a. VA^{-1}s
 - b. Ωs
 - c. wb A^{-1}
 - d. all
11. In an AC circuit, the current $I = I_0 \sin(\omega t - \pi/2)$ lags behind the emf $e = E_0 \sin(\omega t - \pi/2)$ by
 - a. ω
 - b. $\pi/4$
 - c. $\pi/2$
 - d. π
12. In an electromagnetic wave, the phase difference between electric field and magnetic field is
 - a. 0
 - b. $\pi/4$
 - c. $\pi/2$
 - d. π

54. A circular coil of 50 turns and radius 25 cm carries a current of 6A. It is suspended in a uniform magnetic field of induction 10^{-3} T. The normal to the plane of the coil makes an angle of 60° with the field. Calculate torque of the coil.
55. Explain the various energy losses in a transformer.
56. Derive the expression for the radius of the n^{th} dark ring.
57. Explain the spectral series of hydrogen atom.
58. Obtain Einstein's photo electric equation.
59. Explain length contraction
60. Calculate the binding energy and binding energy per nucleon of ${}_{20}\text{Ca}^{40}$ nucleus. Given, mass of 1 proton = 1.007825 amu; mass of 1 neutron = 1.008665 amu; mass of ${}_{20}\text{Ca}^{40}$ nucleus = 39.96259 amu.
 (Or)
 Calculate the mass of coal in ton required to produce the same energy as that produced by the fission of 1 kg of U^{235} . Given: Heat of combustion of coal = 33.6×10^6 J/kg ; 1 tone = 1000 kg ; Energy per fission of U^{235} = 200 MeV ; Avogadro number = 6.023×10^{23} .
61. State and prove Demorgan theorems.
62. Draw the functional block diagram of AM radio transmitter.

Part - IV

Note : (i) Answer any four questions in detail. (04 X 10 = 40)
 (ii) Draw diagrams wherever necessary.

63. Explain the principle, construction and working of Van de Graff Generator
64. Discuss the motion of a charged particle in a uniform magnetic field.
65. Discuss with theory, the method of inducing emf in a coil by changing its orientation with respect to the direction of the magnetic field.
66. What is known as interference? Derive an expression for bandwidth of interference fringes in young's double slit experiment.
67. With the help of energy level diagram explain the working of He-Ne laser.
68. Explain the stellar energy with proton-proton cycle and Carbon-nitrogen cycle
69. Explain the working of a Colpitt's oscillator.
70. With the help of block diagram of monochrome TV receiver

13. Of the following, which one is a biaxial crystal?
 a. tourmaline b. ice c. calcite d. mica
14. If the wavelength of the light is reduced to half, then the amount of scattering will
 a. increase by 16 times b. decrease by 16 times
 c. increase by 256 times d. decrease by 256 times
15. A Nicole prism is based on the principle of
 a. refraction b. reflection c. double refraction d. diffraction
16. The ratio of radii of the first three Bohr orbits is
 a. 1 : 2 : 3 b. 1 : 1/2 : 1/3 c. 1 : 8 : 27 d. 1 : 4 : 9
17. In hydrogen atom, which of the following transitions produce a spectral line of maximum frequency?
 a. 2 → 1 b. 6 → 2 c. 4 → 3 d. 5 → 2
18. In Millikan's experiment, an oil drop of mass 4.9×10^{-14} kg is balanced by applying a potential difference of 2 kV between the two plates which are 2 mm apart. The charge of the drop is
 a. 1.96×10^{18} C b. 1.602×10^{19} C c. 12 C d. 9×10^{19} C
19. If the potential difference between the cathode and the target of Coolidge tube is 1.24×10^5 V, then the minimum wavelength of continuous x-rays is
 a. 10 Å b. 1 Å c. 0.1 Å d. 0.01 Å
20. The photoelectric effect can be explained on the basis of
 a. corpuscular theory b. wave theory
 c. electromagnetic theory d. quantum theory
21. The wavelength of the matter wave is independent of
 a. mass b. velocity c. momentum d. charge
22. The time taken by the radioactive element to reduce to 1/e times is
 a. half life b. mean life c. half life/2 d. twice the mean life
23. The ionization power is maximum for
 a. Neutrons b. alpha particles c. gamma rays d. beta particles
24. When ${}_{5}\text{B}^{10}$ is bombarded with neutron and α -particle is emitted, the residual nucleus is
 a. ${}_{3}\text{Li}^7$ b. ${}_{1}\text{H}^2$ c. ${}_{1}\text{H}^3$ d. ${}_{2}\text{He}^4$
25. In a nuclear reactor cadmium rods are used to
 a. speed up neutrons b. slow down neutrons
 c. absorb neutrons d. remove heat
26. In a Collpitt's oscillator circuit
 a. Capacitive feedback is used b. Tapped coil is used
 c. No tuned LC circuit is used d. No capacitor is used
27. An example of n-type semiconductor is
 a. Pure germanium b. Pure silicon
 c. Silicon doped with phosphorus d. Germanium doped with boron
28. What will be the input of A and B for the Boolean Expression?
 $(A + B) \cdot (A \cdot B) = 1$?
 a. 0, 1 b. 1, 0 c. 0, 0 d. 1, 1
29. In T.V. transmission, the picture should not be scanned during the return journey of the scanning. This is done by
 a. Blanking pulse b. Saw tooth potential
 c. Horizontal synchronizing pulse d. Vertical synchronizing pulse

30. Through which mode of propagation, the radio waves can be sent from one place to another
 a. Ground wave propagation b. Sky wave propagation
 c. Space wave propagation d. All the above

Part – II

Note : Answer any fifteen questions. (15 X 03 = 45)

31. Distinguish between polar and non polar molecules
32. Why is it safer to be inside a car than standing under a tree during lightning?
33. State Kirchhoff's laws
34. The resistance of a Nichrome wire at 0°C is 100. If its temperature coefficient of resistance is 0.004/°C, find its resistance at boiling point of water.
35. What is called superconductivity?
36. Define; ampere in terms of force.
37. Define r m s value of A.C.
38. Define power factor
39. Why does the sky appear blue in color?
40. The refractive index of the medium is $\sqrt{3}$. Calculate the angle of refraction if the un-polarized light is incident on it at the polarizing angle.
41. Give the conditions to achieve laser action.
42. Define amu.
43. Mention any three applications of photo electric cells.
44. What is α - decay? Give an example.
45. Define: Curie.
46. What is pair production and annihilation.
47. What is rectification?
48. Mention the advantages of ICS.
49. State demorgan theorem.
50. What is meant by skip distance?

Part – III

Note : (i) Answer the question 60 compulsory. (07 X 05 = 35)
 (ii) Of the remaining 11 questions, answer any six questions.
 (iii) Draw diagrams wherever necessary.

51. The plates of a parallel plate capacitor have an area of 90 cm² each and are separated by 2.5 mm. The capacitor is charged by connecting it into a 400 V supply. How much electrostatic energy is stored by the capacitor?
52. Obtain the condition for bridge balance in Wheat stone's bridge.
53. Derive the relation between current and drift velocity