

MARCH/APRIL-2014

II P.U.C PHYSICS (33)

Time : 3 hrs 15 min.

Max Marks : 70

General instructions:

- All parts are compulsory.
- Answers without relevant diagram / figure / circuit wherever necessary will not carry any marks.
- Direct answers to the Numerical problems without detailed solutions will not carry any marks.

PART - A

I. Answer all the following

10 × 1 = 10

- Write the SI unit of charge.
- Define mobility of electron.
- What is the nature of force between two parallel conductors carrying currents in the same direction?
- Draw the pattern of magnetic field lines for a bar magnet.
- Give the expression for energy stored in the inductance coil carrying current.
- How is r.m.s value of voltage of a.c is related to peak value of a.c voltage?
- What is wave front of light waves?
- State the radioactive decay law.
- Write the truth table of logic OR gate.
- Give the bandwidth of TV signals for transmission.

PART - B

II. Answer any FIVE of the following questions.

5×2=10

- State and explain Coulomb's law in electrostatics.
- Draw Wheatstone's bridge circuit and write the condition for its balance.
- What is magnetic susceptibility? For which material it is low and positive?
- Mention any two advantages of eddy currents in the practical applications.
- Who predicted the existence of electromagnetic waves? Give the wavelength range of electromagnetic spectrum.
- Explain Malus law for polaroids.
- Write any two types of electron emission.
- Why there is need for modulation?

PART - C

III. Answer any FIVE of the following questions.

5×3=15

- Derive an expression for potential energy of a system of two point charges in the absence of the external electric field.
- Write three uses of cyclotron.
- What are (i) magnetic declination. (ii) magnetic dip and (iii) horizontal component of earth's magnetic field at a place ?
- State and explain Lenz's law for induced emf.
- Explain the construction of the transformer. Mention its principle.

24. Mention three applications of total internal reflection of light.
25. Give three characteristics of photon.
26. How is Zener diode used as voltage regulator.

PART - D

IV. Answer any TWO of the following questions. 2×5=10

27. State Gauss law in electrostatics. Using the law, derive an expression for electric field due to a uniformly charged thin spherical shell at point outside the shell.
28. With the help of circuit diagram, obtain the expression for equivalent resistance of two resistors connected in parallel.
29. Derive the expression for magnetic field at a point on the axis of a circular current loop.

V. Answer any TWO of the following questions. 2×5=10

30. Obtain the expression for fringe width in the case of interference of light waves.
31. Write three postulates of Bohr. Mention two limitations of Bohr model.
32. Explain the formation of energy bands in solids. On the basis of energy bands distinguish between a metal, a semiconductor and an insulator.

VI. Answer any THREE of the following questions. 3×5=15

33. In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3} \text{ m}^2$ and the distance between the plates is 3mm. Calculate the capacitance of the capacitor. If the capacitor is connected to a 100V supply, what is the charge on each plate of the capacitor? (Absolute permittivity of free space = $8.85 \times 10^{-12} \text{ Fm}^{-1}$)
34. A battery of internal resistance 3Ω is connected to 20Ω resistor and potential difference across the resistor is 100V. If another resistor of 30Ω is connected in series with the first resistor and the battery again connected to the combination. Calculate the e.m.f and the terminal potential difference across the combination.
35. Calculate resonant frequency and Q-factor of a series LCR circuit containing a pure inductor of inductance 3H, capacitor of capacitance $27\mu\text{F}$ and resistor of resistance 7.4Ω .
36. Two lenses of focal length 0.20m and 0.30m are kept in contact. Find the focal length of the combination. Calculate powers of two lenses and combination.
37. Calculate the binding energy and binding energy per nucleon (in MeV) of a nitrogen nucleus (${}^7\text{N}^{14}$) from the following data :
 Mass of proton = 1.00783 u, Mass of neutron = 1.00867 u,
 Mass of nitrogen nucleus = 14.00307 u

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