

Instructions : a) **All Parts are compulsory.**

b) **Answer without relevant diagram / figure / circuit wherever necessary will not carry any marks.**

c) **Numerical problems solved without writing the relevant formulae carry no marks.**

PART - A

I. Answer all the following :

(10×1=10)

1. Define S.I. unit of charge.
2. A resistor is marked with colours red, red, orange and gold. Write the value of its resistance.
3. State Ampere's circuital law.
4. What is magnetic declination ?
5. Mention the significance of Lenz's law.
6. How does the power of a lens vary with its focal length ?
7. What is the conclusion of Davison and Germer experiment on the nature of electron ?
8. Name the spectral series of hydrogen which lies in the ultraviolet region of electromagnetic spectrum.
9. Define specific binding energy.
10. What is attenuation in communication system ?

PART - B

II. Answer any five of the following questions :

(5×2=10)

11. Write Coulomb's law in vector form. Explain the terms.
12. Mention two limitations of Ohm's law.
13. Write two properties of magnetic lines of force.



14. Current in a coil falls from 2.5 A to 0.0 A in 0.1 second inducing an emf of 200V. Calculate the value of self inductance.
15. Mention two applications of infrared radiation.
16. Draw the ray diagram of image formation in case of compound microscope.
17. What is photo diode ? Mention its one use.
18. Draw the block diagram of generalised communication system.

PART - C

III. Answer any five of the following questions :

(5×3=15)

19. Derive the expression for capacitance of parallel plate capacitor.
20. Explain with circuit diagram how to convert galvanometer into an ammeter.
21. Write three difference between diamagnetic and paramagnetic substances.
22. Derive the expression for motional EMF induced in a conductor moving in a uniform magnetic field.
23. Show that voltage leads current by $\frac{\pi}{2}$, when A.C. voltage applied to pure inductance.
24. What is interference ? Write the condition for path difference in case of constructive and destructive interference.
25. By assuming Bohr's postulates derive an expression for radius of n^{th} orbit of electron, revolving round the nucleus of hydrogen atom.
26. Distinguish between conductor and semiconductor on the basis of band theory of solids.

PART - D

IV. Answer any two of the following questions :

(2×5=10)

27. Derive an expression for electric field due electric dipole at a point on an equatorial line.
28. What is equivalent resistance ? Derive the expression for effective resistance of two resistors connected in parallel.
29. Derive an expression for magnetic field strength at any point on the axis of a circular current loop using Biot-Savart's law.



V. Answer any two of the following questions :

(2×5=10)

30. Derive the expression for refractive index of the material of the prism in terms of angle of the prism and angle of minimum deviation.
31. Write Einstein's equation of photoelectric effect. Give Einstein's explanation of photoelectric effect.
32. With a neat circuit diagram, explain the working of an nPn transistor in CE mode as an amplifier with input and output waveform.

VI. Answer any three of the following questions :

(3×5=15)

33. Two point charges $+1 \text{ nC}$ and -4 nC are 1 m apart in air. Find the positions along the line joining the two charges at which resultant potential is zero.
34. Two cells of emf 2 V and 4 V and internal resistance 1Ω and 2Ω respectively are connected in parallel so as to send the current in the same direction through an external resistance of 10Ω . Find the potential difference across 10Ω resistor.
35. A sinusoidal voltage of peak value 283 V and frequency 50 Hz is applied to a series LCR circuit in which $R = 3 \Omega$, $L = 25.48 \text{ mH}$ and $C = 786 \mu\text{F}$.

Find :

- a) Impedance of the circuit
 - b) The phase difference between the voltage across the source and the current
 - c) The power factor.
36. In a Young's double slit experiment distance between the slits is 1 mm . The fringe width is found to be 0.6 mm . When the screen is moved through a distance of 0.25 m away from the plane of the slit, the fringe width becomes 0.75 mm . Find the wavelength of light used.
 37. Determine the mass of Na^{22} which has an activity of 5 mCi . Half life of Na^{22} is 2.6 years . Avagadro number = 6.023×10^{23} atoms.