PHYSICS QUESTION PAPER

Q. 1. Select and write the most appropriate answer from the given alternatives for each sub-question :   [8]

(i) During the refraction of a green light from denser medium to rarer medium the property of light that always remains constant is its ....   (1)

    (a) speed   (b) frequency   (c) wavelength   (d) direction

(ii) Electric intensity due to a charged sphere at a point outside the sphere increases with increase in ....   (1)

    (a) dielectric constant   (b) distance from the centre of sphere

    (c) charge on sphere   (d) square of distance from the centre of sphere

(iii) The range of an ammeter can be increased by ....   (1)

    (a) decreasing series resistance   (b) increasing series resistance

    (c) decreasing shunt resistance   (d) increasing shunt resistance

(iv) Which logic gate corresponds to the truth table given below ?   (1)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

    (a) AND   (b) NOR   (c) OR   (d) NAND.

(v) For constructive interference, the phase difference between two waves should be   (1)

    (a) $0, \frac{\pi}{2}, \pi, ...$ (b) $0, 2\pi, 4\pi, ...$ (c) $\pi, 3\pi, 5\pi, ...$ (d) $\frac{\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{4}, ...$

(vi) The minimum number of geostationary satellites needed for global coverage is ......   (1)

    (a) 2   (b) 3   (c) 4   (d) 6

(vii) The magnetic induction at a point P on the axis of a short magnetic dipole is 16 times the magnetic induction at a point Q on its equator. The ratio of distances of P and Q from the centre of the dipole is ....   (1)

    (a) 1 : 4   (b) 1 : 2   (c) 2 : 1   (d) 8 : 1

(viii) The time taken by an electron to complete one revolution in the first orbit of hydrogen atom of radius 0.53 A. U. with speed 2.18×10^6 m/s will be ....   (1)

    (a) 1.527×10^{-15}s   (b) 1.527×10^{-16}s

    (c) 1.527×10^{-17}s   (d) 1.527×10^{-18}s

Q. 2 (A) Attempt any ONE :   [8]

(i) The number of waves in 6 cm of vacuum is same as the number of waves in x cm of a medium. If the refractive index of the medium is $\frac{3}{2}$, find x.   (2)

(ii) Three condensers are connected as shown in figure below. Calculate the effective capacitance between A and B.   (2)
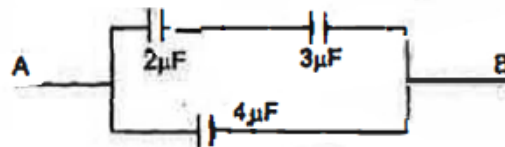
(B) Attempt any TWO :

(i) Obtain an expression for the e.m.f. induced in a coil rotating in a uniform magnetic field. Show graphically the variation of induced e.m.f. with respect to time.   (3)

(ii) Explain the construction and working of cyclotron.   (3)

(iii) Derive an expression for the magnetic potential at any point due to a short magnetic dipole.   (3)

Q. 3 (A) Attempt any ONE :   [8]

(i) Define : (a) Neutral temperature, and (b) Inversion temperature in case of thermocouple.   (2)

(ii) State the formula for sensitivity of moving coil galvanometer. How can sensitivity be increased ?   (2)

(B) Attempt any TWO :

(i) Explain with schematic diagram, the construction of an electron microscope. State its any   (3)

(ii) Explain with neat diagram, the construction of optical fibre. State any 'two' advantages of optical communication over conventional communication system. (3)

(iii) Derive an expression for the energy of a charged condenser. Express it in different forms. (3)

Q. 4 (A) Attempt any TWO : [8]

(i) Draw a neat labelled ray diagram of refraction of a plane wavefront at a plane surface. (2)

(ii) Draw neat labeled ray diagrams showing magnified and diminished images formed by a convex lens in biprism experiment. (2)

(iii) Draw a neat labelled energy level diagram for hydrogen atom. (2)

(B) Attempt any ONE :

(i) State Einstein's photoelectric equation, hence explain the characteristics of photoelectric Effect. (4)

(ii) What is a P – N Junction diode ? With a neat circuit diagram explain the use of P – N junction diode as a full wave rectifier. (4)

Q. 5 (A) Attempt any TWO : [8]

(i) In Young's experiment, the separation between the slits is 3 mm and the distance between the slits and the screen is 1 m. If the wavelength of light used is 6000 A. U., calculate the fringe width. What will be the change in fringe width, if entire apparatus is immersed in a liquid of refractive index $\frac{4}{3}$. (4)

(ii) The length of potentiometer wire is 4 m and its resistance is 18 Ω. A battery of e.m.f. 2 V and internal resistance 2 Ω is connected across the wire. Calculate the potential gradient. If the balancing length for a cell of e.m.f. E_1 is 200 cm, calculate E_1. (4)

(iii) In a series LCR circuit, the inductor of inductance 100 mH, a resistor of 10Ω and a variable capacitor are connected across 20 V, 50 Hz supply. At what capacitance will resonance occur ? Find the corresponding current. (4)