

**B.Sc. (Part-II) Semester-III Examination
PHYSICS**

Time : Three Hours]

[Maximum Marks : 80

Note :— (1) All questions are compulsory.

(2) Draw suitable and neat diagram wherever necessary.

1. (A) Fill in the blanks :— 2

- (i) The input impedance of an ideal OPAMP is _____.
- (ii) The maximum concentration of ozone gas lies in _____ layer of earth's atmosphere.
- (iii) For operation of transistor in active region the collector-base junction must be _____ biased.
- (iv) The value of transistor current gain in CB mode (α) is always _____ than 1.

(B) Choose correct alternative :— 2

- (i) Electric flux is a _____ quantity.
 - (a) scalar (b) vector
 - (c) constant (d) zero
- (ii) When a trivalent impurity is added to pure semiconductor, it becomes ?
 - (a) An insulator (b) An Intrinsic semiconductor
 - (c) p-type semiconductor (d) n-type semiconductor
- (iii) The Hall coefficient R_H is negative for :
 - (a) Intrinsic semiconductor (b) p-type semiconductor
 - (c) n-type semiconductor (d) None of the above
- (iv) Common mode rejection ratio is :

- (a) $\frac{A_v(\text{Diff.})}{A_v(\text{Com.})}$ (b) $\frac{A_v(\text{Com.})}{A_v(\text{Diff.})}$
- (c) $A_v(\text{Com.}) + A_v(\text{Diff.})$ (d) $A_v(\text{Com.}) \times A_v(\text{Diff.})$

(C) Answer in **ONE** sentence :— 4

- (i) Define Extrinsic semiconductor.
- (ii) What is fermi level ?
- (iii) What is Epicenter of earthquake ?
- (iv) Write down the relation between three parameters of the FET.

2. (A) Define divergence of a vector and give its physical significance. 4

(B) State and prove Stoke's theorem. 6

(C) Explain line integral with example. 2

OR

- 3. (P) State and prove Ampere's circuital law. 4
- (Q) Derive an expression for work done on charge in an electrostatic field 6
- (R) Explain Lorentz force equation. 2
- 4. (A) State Faradays law of electromagnetic induction and derive an expression

$$\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t} \quad 6$$

- (B) Derive the relation $\nabla \cdot \vec{D} = \rho$. 4
- (C) State Maxwell's equations for free space. 2

OR

- 5. (P) What is Poynting vector ? Explain its physical significance. 4
- (Q) Obtain the equation : $\nabla \times \vec{H} = \vec{J} + \frac{\partial \vec{D}}{\partial t}$ 6
- (R) What is characteristic impedance of electromagnetic wave ? 2
- 6. (A) What is Hall effect ? Derive an expression for Hall coefficient. 7
- (B) Explain construction and working of LED. 5

OR

- 7. (P) Describe n-type and p-type semiconductor. 6
- (Q) Explain forward and reverse biasing of p-n junction diode. 4
- (R) Explain potential barrier in pn-junction diode. 2
- 8. (A) Explain the construction and working of n-channel JFET. 5
- (B) Draw a block diagram of operational amplifier and explain working of each block. 5
- (C) A given transistor has current gain $\beta = 50$, calculate the value of α ? 2

OR

- 9. (P) Explain working of NPN transistor. 5
- (Q) Explain how op-amp can be used as an inverting amplifier. 5
- (R) Draw circuit diagram to plot the characteristics of JFET. 2
- 10. (A) State postulates of special theory of relativity. 2
- (B) Derive Lorentz transformation equations. 6
- (C) Explain length contraction and derive the expression for the same. 4

OR

- 11. (P) Obtain an expression for relativistic addition of velocities using Lorentz transformation. 6
- (Q) Derive Einstein's mass-energy relation $E = mc^2$ 6
- 12. (A) What is earthquake ? Explain different types of earthquakes. 6
- (B) Explain internal structure of earth. 6

OR

- (P) Explain the scattering, absorption and reflection of solar radiation by atmosphere. 6
- (Q) What are the seismic waves ? Explain different types of seismic waves. 3
- (R) Explain the vertical division of atmosphere on the basis of temperature. 3