AW–1684

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) $\dfrac{Av\,(Diff.)}{Av\,(Com.)}$ (b) $\dfrac{Av\,(Com.)}{Av\,(Diff.)}$

      (c) Av(Com.) + Av(Diff.)   (d) Av(Com.) × Av(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

$$\overline{V} \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}.$$ 6

    (B) Derive the relation $\nabla . D = \rho$. 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 : $\overline{\nabla} \times \overline{H} = \overline{J} + \frac{\partial \overline{D}}{\partial t}$ 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