AV–1734

B.Sc. Part–II Semester–III Examination
PHYSICS

Time : Three Hours]   [Maximum Marks : 80

Note :— (1) **ALL** questions are compulsory.

(2) Draw neat diagrams wherever necessary.

1. (a) Fill in the blanks :   2

   (i) The covalent bonds in semiconductor are formed due to _____ of electrons.

   (ii) For transistor the value of α is _____ than the value of β.

   (iii) When vector field spreads out from the point of consideration then the value of divergence of vector field is _____ .

   (iv) Innermost structural shell of earth is _____ .

   (b) Choose the correct alternatives :   2

   (i) The emitter region of transistor is heavily doped because it _____

      (a) has to supply majority charge carriers

      (b) has to supply minority charge carriers

      (c) is the first region of the transistor

      (d) must possess high resistance.

   (ii) The direction of propagation of electromagnetic wave is given by :

      (a) $\bar{H}$ (b) $\bar{E}$

      (c) $\bar{E} \times \bar{H}$ (d) $\bar{E} \cdot \bar{H}$

   (iii) Divergence of a vector quantity is _____ .

      (a) Scalar   (b) Vector

      (c) Unity   (d) Zero

   (iv) The colour of light emitted by LED depends on _____ :

      (a) Voltage applied

      (b) Current flowing through it

      (c) The type of semiconducting materials used

      (d) All above

   (c) Answer in one sentence :   4

   (i) Define current gain α of transistor .

   (ii) What is non-inertial frame of reference ?

   (iii) What is physical significance of poynting vector ?

   (iv) What is 'Hall coefficient'?

2. **EITHER**

   (a) State and prove Stoke's theorem.   5

   (b) Define the curl of a vector field and explain its physical significance.   4

   (c) State and explain Biot-Savart law. Express it in mathematical form.   3

OR

3. (p) State and prove Guass's divergence theorem. 5

   (q) Define electric flux. 2

   (r) State and prove Ampere's circuital law. Write the vector form of Ampere's circuital law. 5

4. **EITHER**

   (a) State and prove Poynting Theorem. 6

   (b) State and explain Faraday's and Lenz's law of electromagnetic induction. 6

   OR

5. (p) Explain the concept of Displacement current. 2

   (q) Explain physical significance of Maxwell's equations. 4

   (r) Derive Maxwell's equation $\nabla \times H = J + \dfrac{dD}{dt}$. State its equivalent integral form. 6

6. **EITHER**

   (a) Explain Varactor diode with its working. 4

   (b) What is depletion layer ? What happens to the depletion layer under forward bias and reverse bias ? 4

   (c) What is p-n junction ? Explain the working of p-n junction under : 4

       (i) Forward bias   (ii) Reverse bias.

   OR

7. (p) Explain : 4

       (a) Breakdown voltage   (b) Knee voltage.

   (q) State and Explain I-V characteristics of p-n junction diode. 4

   (r) What is Hall Effect ? State its applications. 4

8. **EITHER**

   (a) Explain the construction and working of n-p-n transistors. 6

   (b) Explain input and output characteristics of a transistor in CE configuration. 6

   OR

9. (p) Explain the use of OP-Amp as an integrator and obtain an expression for its output. 5

   (q) Define the parameters of JFET and obtain the relation between them. 5

   (r) Define α and β for transistor. 2

10. **EITHER**

   (a) Obtain an expression for variation of mass with velocity of a body. 5

   (b) Derive an expression for time dilation. 5

   (c) State the postulates of special theory of relativity. 2

OR

11. (p) Obtain an expression for relativistic addition of velocities. 4

    (q) Derive mass-energy relation. 6

    (r) A rod 10m long is moving with a velocity of 0.9 times the velocity of light. How much will its length appear to an observer on earth ? 2

12. **EITHER**

    (a) Explain the vertical division of atmosphere. 5

    (b) Explain the types of earthquakes. 4

    (c) Give the different intensity scales, of earthquake. 3

    OR

13. (p) Explain the constituents and properties of Crust, Mantle and Core of the earth with suitable diagram. 6

    (q) Discuss the scattering, absorption and reflection of solar radiation by the atmosphere. 6