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 :

(i) The line integral of a conservative field for a closed path is _____.

(ii) Length of object in motion appears to be _____.

(iii) Unit of characteristic impedance is _____.

(iv) Harmful ultraviolet radiations are absorbed by _____ gas in stratosphere. 2

(B) Choose correct alternative :

(i) SI unit of conductivity is :

(a) $ohm^{-1}meter^{-1}$ (b) $ohm^{-1}cm^{-1}$

(c) ohm – cm (d) ohm – meter

(ii) The potential of virtual ground in op-amp is always :

(a) Infinite (b) Zero

(c) Constant (d) Changing

(iii) The gradient of a scaler function is :

(a) Scaler quantity (b) Vector quantity

(c) Zero (d) Constant quantity

(iv) The layer of atmosphere adjacent to earth surface is :

(a) Mesosphere (b) Thermosphere

(c) Troposphere (d) Stratosphere 2

(C) Answer in **one** sentence :

(i) State Ampere's circuital law.

(ii) Define mobility of charge carriers.

(iii) Define pinched off voltage in FET.

(iv) Define focus of an earthquake. 4

EITHER

2. (A) Explain surface integral. 2

(B) Define divergence of vector field. Give its physical significance. 4

(C) State and prove Stock's theorem. 6

OR

3. (P) State Lorentz force equation. 1

(Q) State and prove Gauss's Divergence theorem. 6

(R) Derive an expression for work done on a charge in an electrostatic field. 5

EITHER

4. (A) Derive Maxwell's equation :

$$\nabla \times \overline{E} = -\frac{\partial \overline{B}}{\partial t}$$ 5

(B) State and explain Faraday's law of electromagnetic induction. 3

(C) What is Poynting vector ? Give the physical significance of Poynting vector. 4

OR

5. (P) Using Maxwell's equation, derive an equation of plane electromagnetic wave in free space. 6

(Q) State and prove Poynting theorem. 6

EITHER

6. (A) What is 'Hall effect' ? Derive an expression for Hall coefficient. 6

(B) Explain the construction and working of LED. 4

(C) What is doping in semiconductor ? 2

OR

7. (P) Describe the construction and working of varactor diode. 4

(Q) Explain p-type and n-type semiconductors. 4

(R) Derive an expression for conductivity of an intrinsic semiconductor. 4

EITHER

8. (A) Mention the different types of transistor configurations. Draw the circuit of each type using NPN transistor. 4

(B) Distinguish between BJT and FET. 2

(C) Explain the construction and working of JFET. 6

OR

9. (P) What are the characteristics of an ideal OP-AMP ? Explain the use of OP-AMP as an integrator. 6

(Q) Obtain the relation between α and β for transistor. 2

(R) Draw and explain the block diagram of IC of an OP-AMP. 4

EITHER

10. (A) Derive Einstein's Mass-Energy relation. 5

(B) Obtain an expression for relativistic addition of velocities. 5

(C) State the postulates of special Theory of Relativity. 2

OR

11. (P) Derive the Lorentz transformations. 6

(Q) Explain time dilation. 3

(R) When a meter stick is projected into space its length appears to be contracted to 50 cm. Calculate velocity of its projection. 3

EITHER

12. (A) Describe in brief the structure of the atmosphere around the earth with respect to temperature. 6

(B) Explain, how clouds are formed. 3

(C) Explain the role of ozone in the atmosphere. 3

OR

13. (P) Explain the tectonic and non-tectonic earthquakes. 5

(Q) What are seismic waves ? Explain different types of seismic wave. 4

(R) Explain Lithosphere and Hydrosphere. 3