

B.Sc. Part-II (Semester – III) Examination

3S : PHYSICS

Time—Three Hours]

[Maximum Marks—80

N.B. :— (1) ALL questions are compulsory.

(2) Draw neat diagrams wherever necessary.

1. (a) Fill in the blanks :

(i) The mobility of an electron is _____ than the mobility of hole.

(ii) The input impedance of an ideal OP-AMP is _____.

(iii) The layer of atmosphere adjacent to earth surface is _____.

(iv) The mass of the object moving with the speed of light is _____.

2

(b) Choose the correct alternatives :

(i) The operation of JFET involves :

- (a) A flow of minority carriers
- (b) A flow of majority carriers
- (c) Recombination
- (d) Negative resistance

(ii) Depletion region in p-n junction diode contains :

- (a) Electrons
- (b) Holes
- (c) Electrons and Holes
- (d) None of the above

(iii) Electric flux is a _____ quantity.

- (a) Scalar
- (b) Vector
- (c) Constant
- (d) Zero

EITHER

- 12. (a) Explain the role of ozone in the atmosphere. 3
- (b) What are Seismic Waves ? Explain different types of seismic waves. 4
- (c) Explain the vertical division of atmosphere on the basis of temperature. 5

OR

- 13. (p) Explain the internal structure of earth. 5
- (q) Explain the tectonic and non-tectonic earthquakes. 5
- (r) Define :
 - (i) Focus
 - (ii) Epicenter of an earthquake. 2

(b) Explain the construction and working of NPN transistor. 5

(c) State the characteristics of an ideal OP-AMP. 3

OR

9. (p) Explain the working on n-channel JFET. 5

(q) Explain the use of OP-AMP as adder with suitable diagram. 4

(r) Define FET parameters. 3

EITHER

10. (a) State inverse Lorentz-Transformation equation. 2

(b) Derive Einstein's mass energy relation, $E = mc^2$. 5

(c) Show that moving mass appears to be heavier than rest mass. 5

OR

11. (p) Obtain expression for relativistic addition of velocities. 6

(q) Derive Lorentz Transformation. 6

(iv) In transistor, more popular mode is :

(a) CB mode

(b) CE mode

(c) CC mode

(d) All three modes 2

(c) Answer in ONE sentence :

(i) What is Extrinsic Semiconductor ?

(ii) What is Inertial Frame of reference ?

(iii) State Lorentz force equation.

(iv) What is CMMR in OP-AMP ? 4

EITHER

2. (a) State and prove Stoke's Theorem. 5

(b) Deduce an expression for magnetic induction due to long solenoid. 5

(c) Explain Surface Integral. 2

OR

3. (p) State and prove Gauss Divergence Theorem. 5
- (q) Define the divergence of a vector field. Give its Physical significance. 4
- (r) State and explain Ampere's Force Law. 3

EITHER

4. (a) Write Maxwell's equation for free space in differential form. State significance of each equation. 6
- (b) State and prove Poynting Theorem. 6

OR

5. (p) State and explain Faraday's Law of Electromagnetic Induction. 3
- (q) Derive Maxwell's equation :

$$\nabla \cdot \vec{D} = \rho \quad 6$$

- (r) State and explain Lenz's Law of Electromagnetic Induction. 3

EITHER

6. (a) What is Intrinsic and Extrinsic Semiconductor ? Explain p-type and n-type semiconductor using energy band diagram. 6
- (b) Derive an expression for conductivity for intrinsic semiconductor. 4
- (c) Explain the term 'Fermi Energy Level'. 2

OR

7. (p) What is LED ? Explain its construction and working. 5
- (q) Discuss VI characteristics of PN junction in forward and reverse bias mode. 5
- (r) What is doping in case of Semiconductor ? Explain with suitable example. 2

EITHER

8. (a) Mention the different types of Transistor Configuration. Draw the circuit diagram of each type using NPN transistors. 4