

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 value of α is always _____ than 1.
- (ii) Using _____ theorem a surface integral is transformed into a volume integral.
- (iii) The entire concentration of ozone gas above earth is almost contained in _____.
- (iv) Einstein's mass energy equivalence relation is _____.

2

(B) Choose correct alternative

- (i) A FET is a :
 - (a) Bipolar device
 - (b) Unipolar device
 - (c) Bipolar or unipolar device
 - (d) Bipolar and unipolar device
- (ii) $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ represents :
 - (a) Ampere's law
 - (b) Ohm's law
 - (c) Faraday's law
 - (d) Gauss's law

(iii) Relation between α and β of a transistor is :

(a) $\beta = \frac{1-\alpha}{\alpha}$

(b) $\beta = \frac{\alpha}{1+\alpha}$

(c) $\beta = \frac{1+\alpha}{\alpha}$

(d) $\beta = \frac{\alpha}{1-\alpha}$

(iv) When a pentavalent impurity is added to pure semiconductor, it becomes _____.

- (a) An insulator
- (b) An intrinsic semiconductor
- (c) p-type semiconductor
- (d) n-type semiconductor

2

(C) Answer in one sentence :

- (i) State Ampere circuital law.
- (ii) What is depletion region ?
- (iii) Write down the relation between three parameters of the FET.
- (iv) Define inertial frame of reference.

4

EITHER

2. (A) State and prove Stoke's theorem.

6

(B) Explain :

- (i) Line integral
- (ii) Volume integral
- (iii) Surface integral.

6

OR

3. (P) State and prove Gauss's Divergence theorem.

6

(Q) Derive an expression for work done on charge in an electrostatic field.

6

EITHER

4. (A) Derive Maxwell's electromagnetic equation $\nabla \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$. 6
- (B) Obtain the equation : $\nabla \times \vec{H} = \vec{j} + \frac{\partial \vec{D}}{\partial t}$. 6

OR

5. (P) State and prove Poynting theorem and hence explain Poynting vector. 6
- (Q) State Faraday's law of electromagnetic induction and obtain its integral form. 6

EITHER

6. (A) What is Hall effect ? Derive an expression for Hall coefficient. 7
- (B) Explain construction and working of LED. 5

OR

7. (P) Explain potential barrier. 2
- (Q) Give the construction of n-type and p-type semiconductor. 6
- (R) Explain forward and reverse biasing of a p-n junction diode. 4

EITHER

8. (A) State the characteristics of ideal operational amplifier. 3
- (B) Explain how op-AMP can be used as an integrator. 4
- (C) Explain construction and working of J-FET. 5

OR

9. (P) What are the different types of transistor ? Draw symbol of each. 2
- (Q) Distinguish between BJT and FET. 3
- (R) Define α and β of transistor. 2
- (S) Explain construction and working of n-p-n transistor. 5

EITHER

10. (A) State postulates of special theory of relativity. 2
(B) Derive Lorentz transformation equations. 6
(C) Explain length contraction and derive necessary formula. 4

OR

11. (P) Obtain an expression for relativistic addition of velocities. 6
(Q) Derive Einstein's mass-energy relation. 6

EITHER

12. (A) Explain scattering, absorption and reflection of solar radiation by atmosphere. 6
(B) How clouds are formed ? 3
(C) Explain seismic waves. 3

OR

13. (P) Explain internal structure of earth. 6
(Q) Define earthquake. Explain different types of earthquake. 6