

AP-444

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 diagram wherever necessary.

1. (A) Fill in the blanks :

- (i) Electric flux is a _____ quantity.
- (ii) If the value of Hall coefficient is negative then sample is _____ type semiconductor.
- (iii) For normal operation of transistor, the collector base junction must be in _____ biased.
- (iv) Ozone layer is located in _____. 2

(B) Choose correct alternative :

- (i) SI unit of conductivity is :
 - (a) $\text{Ohm}^{-1} \text{meter}^{-1}$ (b) $\text{Ohm}^{-1} \text{cm}^{-1}$
 - (c) Ohm. cm (d) Ohm-meter

(ii) A FET is a :

- (a) bipolar device
- (b) unipolar device
- (c) bipolar or unipolar device
- (d) bipolar and unipolar device

(iii) A rocket moves with velocity $0.7c$. Velocity of light w.r.to rocket is :

- (a) $(c + v)$ (b) $(c - v)$
- (c) $(c + v^2)$ (d) c

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

- (a) voltage applied
- (b) current flowing through it
- (c) the type of semiconducting material used
- (d) all of the above

2

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

- (i) What is Fermi level ?
- (ii) Define CMRR.
- (iii) What is inertial frame of reference ?
- (iv) What is an earthquake ?

4

OR

13. (P) Explain the parts of earth as a planet. 6

(Q) Explain the types of earthquakes on the basis of depth of focus, magnitude of earthquake and the cause of their origin. 6

- (C) When a meter stick is projected into space; its length appears to be contracted to 50 cm, calculate velocity of its projection. 3

OR

11. (P) Obtain an expression for relativistic addition of velocities. 4
- (Q) Derive $E = mc^2$. 5
- (R) Calculate the energy in killo-watt hour, when 2 gm matter is converted completely into energy. (Given 1 kWH = 3.6×10^6 Joules) 3

EITHER

12. (A) Explain the interior structure of the earth with suitable diagram. 4
- (B) Explain the scattering, absorption and reflection of solar radiation by atmosphere. 6
- (C) Define the terms :
- (i) Focus
- (ii) Epicentre of an earthquake. 2

EITHER

2. (A) Define the gradient of scalar field. Give its physical significance. 4
- (B) State and prove Gauss's divergence theorem. 6
- (C) Explain line integral. 2

OR

3. (P) Derive an expression for work done on charge in an electrostatic field. 4
- (Q) Explain flux of electric field. 2
- (R) State and prove Ampere's circuital law. 4
- (S) Explain Lorentz Force equation. 2

EITHER

4. (A) State Faraday's law of electromagnetic induction and derive an expression :

$$\nabla \times \vec{E} = - \frac{\partial B}{\partial t} \quad 6$$

- (B) What is characteristic impedance of electromagnetic wave ? 2
- (C) What is poynting vector ? Explain its physical significance. 4

OR

5. (P) Derive Maxwell's relation :

$$\oint_S \vec{D} \cdot d\vec{s} = \int_V \rho \, dV. \quad 4$$

- (Q) State Maxwell's equation for free space. 2

- (R) Prove that velocity of plane electromagnetic wave in free space is :

$$\frac{1}{\sqrt{\mu_0 \epsilon_0}}. \quad 6$$

EITHER

6. (A) Explain the working of forward biased PN-Junction diode. 4

- (B) What is Hall effect ? State its importance. Derive an expression for Hall coefficient. 6

- (C) Distinguish between p-type and n-type semiconductor. 2

OR

7. (P) Explain the depletion region in semiconductor. 3

- (Q) Explain how to obtain forward bias characteristics of PN-junction diode. 4

- (R) Give the construction and working of LED. 5

EITHER

8. (A) Explain the construction and working of n-channel of J-FET. 5

- (B) Draw a block diagram of operational amplifier and explain the working of each block. 5

- (C) A given transistor has current gain $\beta = 60$. If transistor is connected in CB configuration, what is the value of α ? 2

OR

9. (P) Explain working of NPN transistor. 4

- (Q) Draw circuit diagram to study the characteristics of JFET. 2

- (R) Explain how OP-AMP can be used as an inverting amplifier. 4

- (S) Why FETS are less noisy ? 2

EITHER

10. (A) Derive Lorentz transformation. 4

- (B) Deduce an expression for relativity of time (time-dilation). 5