AR – 536

Third Semester B. Sc. (Part – II) Examination

3 S – PHYSICS

P. Pages : 7

Time : Three Hours] [Max. Marks : 80

Note : (1) All questions are compulsory.
(2) Draw suitable and neat diagrams wherever necessary.

1. (a) Fill in the blanks :—

(i) If the value of Hall coefficient is _____ then the type of semiconductor is n–type.

(ii) Accelerated frames are known as _____ frame of reference.

(iii) The output impedence of an ideal OP–Amp is _____.

(iv) The outer layer of the earth is called as _____. 2

(b) Choose the correct alternatives :—

(i) SI unit of Magnetic Flux density is

(a) $\frac{Wb}{m^2}$ (b) tesla

(c) $NA^{-1}m^{-1}$ (d) All of these

(ii) Mobility of electron is more than holes becaues

(a) they are lighter.

(b) they possesses negative charge.

(c) they required less energy to move.

(d) None of these.

(iii) A FET is a

(a) bipolar device.

(b) unipolar device.

(c) bipolar or unipolar device.

(d) bipolar and unipolar device.

(iv) The magnitude of induced e. m. f. is given by

(a) Faraday's law.

(b) Lenz's law.

(c) Fleming left hand rule.

(d) Non of these. 2

(c) Answer in **one** sentence :—

(i) Define Flux of electric field.

(ii) What is "Hall Effect" ?

(iii) What is CMRR in OP–Amp ?

(iv) Define focus of an earthquake. 4

EITHER

2. (a) State and prove Gauss's Divergence theorem. 5

(b) Define gradient of a scaler function ϕ. Give its physical significance. 5

(c) Explain volume integral. 2

OR

3. (p) Give physical significance of curl $\overline{A}$. 3

(q) State and explain Ampere's circuital law. 4

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

EITHER

4. (a) State and explain Faraday's law of electro-magnetic induction. 3

(b) What is Poynting vector ? Explain its physical significance. 3

(c) Derive Maxwell's equation :

$$\nabla \times \vec{H} = \vec{J} + \frac{\partial \bar{D}}{\partial t}$$

State its equivalent integral form. 6

OR

5. (p) Derive Maxwell's equation :

$$\nabla \cdot \bar{D} = \varrho$$

Give its physical significance. 6

(q) State and prove Poynting theorem. 6

EITHER

6. (a) What is P–type semiconductor ? Explain how hole contribute to electric current. 5

(b) Draw and explain the V–I characteristics of PN junction. 5

(c) What is Breakdown voltage ? 2

OR

7. (p) What is Hall effect ? Derive an expression for Hall coefficient. 5

(q) Define conductivity. Obtain an expression for conductivity of intrinsic semiconductor. 5

(r) Explain intrinsic semiconductor. 2

EITHER

8. (a) Explain construction and working of n–channel J–FET. 6

(b) Define α and β. Obtain relation between α and β. 4

(c) Distinguish between BJT and FET. 2

OR

9. (p) Explain construction and working of NPN transistor. 5

(q) Draw the block diagram of IC OP–Amp and explain working of each block. 5

(r) A given transistor has a current gain $\beta = 60$. If transistor is connected in 'CB' configuration, What is the change in collector current, when emitter current changes by 2 mA ? 2

EITHER

10. (a) Derive Einstein's Mass–Energy equivalence relation. 6

(b) Obtain an expression for relativistic addition of velocities. 6

OR

11. (p) Derive Lorentz transformations. 6

(q) Explain Length contraction. 4

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

EITHER

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

(b) Explain the types of earthquakes on the basis of magnitude of earthquake and the cause of their origin. 6

OR

13. (p) Explain the interior structure of the earth with suitable diagram. 4

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

(r) What are the causes of earthquakes ? 2

(s) Define :

(i) Epicentre.

(ii) Focus. 2