



**PBC-003-103002**

Seat No. \_\_\_\_\_

**B. Sc. (Sem. III) (CBCS) Examination**

**November / December - 2018**

**Physics : Paper - 301**

*(New Course)*

**Faculty Code : 003**

**Subject Code : 103002**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- 1 (a) Give the correct answers of following questions : 4
- (1) Define Scalar quantity.
  - (2)  $\text{Div (Curl } f) = \underline{\hspace{2cm}}$
  - (3)  $\vec{A} \cdot (\vec{B} \times \vec{C}) = \underline{\hspace{2cm}}$  of the parallelepiped.
  - (4) The net outward flux of some vector quantity through a closed surface can be represented by which quantity ?
- (b) Answer in brief : (any **one**) 2
- (1) Find the gradient of  $f(x, y, z) = x^3 + y^4 + z^2$ .
  - (2) Find the divergence of  $\vec{F}(x, y) = 4x^2\hat{i} + 4y\hat{j}$ .
- (c) Answer in detail : (any **one**) 3
- (1) Explain the vector triple product.
  - (2) Explain the divergence of vector field.
- (d) Write a note on following : (any **one**) 5
- (1) Explain in detail how vector transform from one system to another system.
  - (2) Explain the fundamental theorems of curls.
- 2 (a) Give the correct answers of following questions : 4
- (1) State the Coulomb's law.
  - (2) What is the unit of electric flux ?
  - (3)  $\nabla \times \vec{E} = \underline{\hspace{2cm}}$ .
  - (4) Write the Poisson's equation.

- (b) Answer in brief : (any **one**) **2**
- (1) A uniformly charged sphere has a total charge of  $200\mu\text{C}$  and radius of 4 cm. Find the electric field intensity at a point 20 cm away from the center of the sphere.
  - (2) Calculate the divergence of the electric field given by  $5\hat{i} - y\hat{j} - z\hat{k}$ .
- (c) Answer in detail : (any **one**) **3**
- (1) Discuss the curl of E.
  - (2) Explain the energy of a point charge distribution.
- (d) Write a note on following : (any **one**) **5**
- (1) Derive the Gauss's law in differential and integral form.
  - (2) Explain the electric field due to a uniformly charged thin spherical shell.
- 3** (a) Give the correct answers of following questions : **4**
- (1) If a charged particle moves in a magnetic field, whether potential energy changes, do you agree? (Yes / No)
  - (2) Write the formula for Ampere's law in differential form.
  - (3) If equal currents are passing through two very long and straight parallel wires in same directions, what happens between them?
  - (4) If a point charge is in motion, can we apply Biot-Savart law to find out the value of current?
- (b) Answer in brief : (any **one**) **2**
- (1) Calculate the magnitude of the magnetic field due to a long thin wire carrying current of 20 Amp at a distance of 4 cm from the wire.  

$$\left(\mu_0 = 4\pi \times 10^{-7} \text{ N/A}^2\right)$$
  - (2) A particle having 4 Coulomb charge passes through magnetic field at  $4\hat{k}\text{T}$  and some uniform electric field with velocity  $25\hat{j}$ . If the Lorentz force acting on it is  $400\hat{i}\text{N}$ . Find the electric field in this region.

- (c) Answer in detail : (any **one**) **3**
- (1) Discuss the straight - line currents by using Biot - Savart Law.
  - (2) Explain: Divergence of magnetic field  $\vec{B}$ .
- (d) Write a note on following : (any **one**) **5**
- (1) Give the quantitative explanation of cycloid motion.
  - (2) What is Ampere's Law? Find out the magnetic field inside a long solenoid using Ampere's Circuital law.
- 4** (a) Give the correct answers of following questions : **4**
- (1) Define dielectrics.
  - (2) What is the susceptibility of wood in vacuum ?
  - (3) What happens when paramagnetic material place in external magnetic field ?
  - (4) What is the unit of Permeability ?
- (b) Answer in brief : (any **one**) **2**
- (1) When you polarize a neutral dielectric, charge moves a bit but the total charge remains zero. This fact should be reflected in the bound charges  $\sigma_b$  and  $\rho_b$ . Prove that the total bound charge vanishes.
  - (2) An infinitely long circular cylinder carries a uniform magnetization  $\vec{M}$ , parallel to its axis. Find the magnetic field due to  $\vec{M}$ , inside the cylinder.
- (c) Answer in detail : (any **one**) **3**
- (1) Discuss Gauss's law in the presence of dielectric.
  - (2) Explain the magnetization of material.
- (d) Write a note on following : (any **one**) **5**
- (1) Discuss the alignment of polar molecules.
  - (2) Explain the magnetic field on atomic orbits with necessary equations.

- 5 (a) Give the correct answers of following questions : 4
- (1) What is transistor biasing ?
  - (2) What is active region in transistor ?
  - (3) If output has been taken across  $R_c$ , whether phase reversal take place or not ?
  - (4) What is a. c. load line ?
- (b) Answer in brief : (any **one**) 2
- (1) A Germanium transistor is to be operated at zero signal  $I_c = 2 \text{ mA}$ . The collector supply  $V_{cc} = 20\text{V}$ , calculate the value of  $R_B$  in base transistor method. ( $\beta = 100$ )
  - (2) Calculate the voltage gain for transistor amplifier having  $R_c = 3K\Omega$ ,  $R_L = 2K\Omega$ ,  $R_{in} = 2K\Omega$  and  $\beta = 100$ .
- (c) Answer in detail : (any **one**) 3
- (1) Discuss biasing with Emitter bias method.
  - (2) Explain bandwidth of single stage transistor amplifier.
- (d) Write a note on following : (any **one**) 5
- (1) Discuss base resistor method of transistor biasing in detail.
  - (2) Explain d. c. and a. c. load line analysis for the single stage transistor amplifier.
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