

**S.Y.B.SC. SEM – III (2014 COURSE) : SUMMER - 2018**  
**SUBJECT: PHYSICS: MATHEMATICAL METHODS FOR PHYSICS**

Day : **Friday**  
Date : **13/04/2018**

Time : **12.00 NOON TO 02.00 PM**  
Max. Marks : 40.

**S-2018-0706**

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate full marks.
- 3) Use of electronic calculator/ log table is allowed

**Q.1** Attempt any **TWO** of the following: **(10)**

- a) For a particle moving along the curved path in a plane, obtain expressions for the radial and transverse component of the velocity and acceleration.
- b) Find the approximate value of  $\sqrt{(5.98)^2 + (8.01)^2}$  using method of total differential.
- c) If  $\vec{e}_r$  and  $\vec{e}_\theta$  are the unit vectors in the plane polar coordinator system, prove that

$$\vec{e}_r = \hat{i}\cos\theta + \hat{j}\sin\theta \quad \text{and} \quad \vec{e}_\theta = -\hat{i}\sin\theta + \hat{j}\cos\theta.$$

**Q.2** Attempt any **TWO** of the following: **(10)**

- a) What is an Argand diagram? Explain addition of two complex numbers by using an Argand diagram.
- b) Define vector triple product of a vectors. Find the volume of a parallelepiped whose edges are given by  $\vec{A} = 3\hat{i} - \hat{j} + 2\hat{k}$ ,  $\vec{B} = 2\hat{i} - 3\hat{j} + 4\hat{k}$  and  $\vec{C} = \hat{i} + 2\hat{j} - \hat{k}$ .
- c) What is the ordinary differential equation? Set up differential equation for any situation in Physical science.

**Q.3** Attempt any **TWO** of the following: **(10)**

- a) Find different values of the third root of  $1 + i\sqrt{3}$ .
- b) If the error committed in the measurement of the length of a cylinder is 10% and that in it's the measurement of radius is 1 %, what will be the error in the volume?
- c) Define gradient of a scalar. Explain the physical significance of the gradient of a scalar.

**Q.4** Attempt any **FIVE** of the following: **(10)**

- a) If  $z = 1 + i\sqrt{3}$  is complex number then what is exponential form of  $z$ . Hence identify  $r$  and  $\theta$ .
- b) Find the stationary points of the function  $f(x) = 2x^3 - 3x^2 - 36x + 2$ .
- c) State and Write down the physical significance of Divergence of vector.
- d) State the order and degree of the given differential equation.

$$\left(\frac{d^2y}{dx^2}\right)^3 - y^2 + 5 = 0$$

- e) Prove that the vector is solenoidal vector.

$$\vec{V} = y^2\hat{i} + z^2\hat{j} + x^2\hat{k}$$

- f) Determine the value of  $1 + i^2 + i^3 + i^4 - i^6 + i^7 + i^8$ .

- g) Prove that vectors are coplanar,  $\vec{A} = 3\hat{i} - \hat{j} + 2\hat{k}$ ,  $\vec{B} = 2\hat{i} + \hat{j} - \hat{k}$  &  $\vec{C} = \hat{i} - 2\hat{j} + 2\hat{k}$ .

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