

**S.Y.B.SC. SEM – III (2014 Course) : WINTER - 2018**  
**SUBJECT: PHYSICS: MATHEMATICAL METHODS FOR PHYSICS (P-31)**

Day: Thursday  
Date: 11/10/2018

Time: 12.00 NOON TO 02.00 PM  
Max. Mark : 40

**W-2018-0799**

**N.B.:**

- 1) All questions are **compulsory**
- 2) Figures to the **right** indicate **full** marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary

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

- a) The acceleration of gravity can be found from the length  $l$  and period  $T$  of pendulum using formula  $g = \frac{4l\pi^2}{T^2}$ , find the relative error in  $g$  in the worst case if the relative error in  $l$  is 5% and relative error in  $T$  is 2%.
- b) Determine the value of  $x$  and  $y$ ; if  $x+iy = (1+i\sqrt{3})^4$
- c) Explain the physical significance of gradient of a scalar field.

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

- a) Obtain quadratic equation in  $z$  whose roots are  $(8+6i)$ .
- b) If three vectors are  $A = 2i - j - k$ ,  $B = i + 2j - 3k$  and  $C = 3i + 2j - pk$  are coplanar then find value of  $p$ .
- c) What is partial differential equation? Set up differential equation for any situation in physical science.

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

- a) Determine different values of fifth root of  $(2\sqrt{3} + 2i)$ .
- b) Find the approximate value of  $\sqrt{(2.99)^2 + (3.99)^2}$  using method of differentials.
- c) Show that  $\nabla \times \nabla\phi = 0$ .

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

- a) If  $\phi = 3x^2y - y^3z^2$ , Find  $\text{grad } \phi$  at point  $(1, -2, -1)$ .
- b) Show that  $e^{i\pi} = -1$  and  $e^{i\pi/2} = i$
- c) If  $F = e^{xy}$  find  $F_x$  and  $F_y$ .
- e) Define the scalar field and vector field. Give example of each.
- f) Prove that vector  $A = 3yz i + zx j + 4xy k$  is solenoidal.
- g) State the condition for co-planarity of three vectors.
- h) Explain in brief line integral of a vector field.

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