

S.Y.B.SC. SEM – III (2014 COURSE) : WINTER - 2017

SUBJECT: PHYSICS: MATHEMATICAL METHODS FOR PHYSICS (P-31)

Day: Thursday
Date: 26/10/2017

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

W-2017-0614

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) Determine the value of x and y; if $x+iy=(1+i\sqrt{3})^4$
- b) The resistance of a uniform wire of length l and resistance R is given by $R = \frac{\rho l}{\pi r^2}$. If error in the measurement of length and radius are 2% and 3% respectively, find the maximum possible percentage error in resistance.
- c) Explain the physical significance of divergence of a vector field.

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

- a) Determine the cube roots of 1.
- b) What is an ordinary differential equation? Set up a differential equation for any situation in physical science.
- c) $\nabla \times (\nabla \phi) = \nabla(\nabla \cdot A) - (\nabla \cdot \nabla) \times A$

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

- a) Express $\frac{9-7i}{2-3i}$ in the form of x+iy
- b) If $E = E_0 \sin(\omega t - kx)$ where E_0, ω and k are constants, show that $\frac{\partial^2 E}{\partial t^2} = \frac{\omega^2}{k^2} \frac{\partial^2 E}{\partial x^2}$
- c) Find the Volume of a parallelepiped whose three edges are $(i + 3j)$, $(3j + 4k)$ and $(6i + 2k)$

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

- a) If $\sqrt{x+iy} = a-ib$, show that $x = a^2 - b^2$ and $y = -2ab$
- b) Determine the value of $i+i^2+i^3+i^4$
- c) If $\Phi = 3x^2y - y^3z^2$, Find the gradient of Φ at point (1, -2, -1).
- d) If $F = e^{xy}$ find F_x and F_y .
- e) Transform $z = 2\sqrt{3} + 2i$ into the polar form and exponential form
- f) State the condition for coplanarity of three vectors.
- g) Explain in brief the line integral of a vector field.

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