RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2019-22] B.A./B.Sc. FIRST SEMESTER (July – December) 2019 Mid-Semester Examination, September 2019

: 16/09/2019 Date : 11 am – 12 noon Time

PHYSICS (Honours) Paper : I[CC 1]

Full Marks : 25

[5×5]

[3+2]

[5]

[5]

[5]

(Answer any five questions)

- Find the values of λ and μ so that surfaces $\lambda x^2 \mu yz = (\lambda + 2)x$, $4x^2y + z^3 = 4$ intersect 1. orthogonally at the point (1, -1, 2). [5]
- a) Show that $\vec{\nabla}\left\{\frac{\vec{a}\cdot\vec{r}}{r^n}\right\} = \frac{\vec{a}}{r^n} \frac{n(\vec{a}\cdot\vec{r})\vec{r}}{r^{n+2}}$ where $r^2 = x^2 + y^2 + z^2$ and $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ is a constant 2. vector and n is an integer.
 - b) Write down the physical significance of gradient of some scalar function.
- Evaluate the surface integral of the field $\vec{F} = (x + y^2)\hat{i} 2x\hat{j} + 2yz\hat{x}$ and the surface S, a plane 3. 2x + y + 2z = 6 in the first octant. [5]
- 4. Solve the differential equation

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^3 e^{2x}$$
[5]

5. Solve the differential equation
$$\frac{dy}{dx} + xy = x^3y^3$$

Determine a general solution of this differential equation $x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 12y = 24$ 6. [5]

- Find eigenvalues and eigen vectors of the matrix $\begin{vmatrix} 6 & 2 \\ -2 & 3 \end{vmatrix}$ 7.
- Find inverse of the matrix 8.
 - $\begin{vmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{vmatrix}$

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