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VA—94—2024

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2024

MATHEMATICS

Paper-XI

(Partial Differential Equations)

(Monday, 16-12-2024) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (1) *All* questions are compulsory.

(2) Figures to the right indicate full marks.

1. Explain the method of multipliers to solve partial differential equation $P_p + Q_q = R$. 15

Solve :

$$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy.$$

Or

(*a*) Explain Charpit's method to solve partial differential equation : 8

$$f(x, y, z, p, q) = 0.$$

(*b*) Solve : 7

$$(D^3 - 4D^2D' + 3DD'^2)\ Z = 0.$$

P.T.O.

2. Explain complementary function of non-homogeneous linear equation : 15

$$(D - mD' - a)\, z = 0$$

Solve :

$$(D - D' - 2)\,(D - D' - 3)\, Z = e^{3x - 2y}.$$

Or

(*a*) Obtain the solution of the wave equation : 8

$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$

using the method of separation of variables.

(*b*) Find the solution of $\frac{\partial^2 u}{\partial x^2} = h^2 \frac{\partial u}{\partial t}$ for which $u(o, t) = u(l, t) = 0$ $u(x, 0) = \sin\frac{\pi x}{l}$ by method of variable separable. 7

3. Attempt any *two* of the following : 10

(*a*) Solve :

$$\frac{\partial^2 z}{\partial x \partial y} = x^2 y$$

Subject to the condition $z(x, 0) = x^2$ and $z(1, y) = \cos y$.

(*b*) Explain the method to solve equation of the type $f(z, p, q) = 0$.

(*c*) Using the method of separation of variables, solve :

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u,$$

where $u(x, 0) = \sigma e^{-3x}$

(*d*) Solve :

$$\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \cdot \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0$$

by the method of separation of variables.

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