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SA—94—2025

FACULTY OF SCIENCE

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

APRIL/MAY, 2025

MATHEMATICS

Paper XI

(Partial Differential Equations)

(Saturday, 26-4-2025) **Time : 2.00 p.m. to 4.00 p.m.**

Time—Two Hours *Maximum Marks*—40

Note :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

1. Explain the rules for finding the complementary function of the equation : 15

$$a_0 \frac{\partial^2 z}{\partial x^2} + a_1 \frac{\partial^2 z}{\partial x \, \partial y} + a_2 \frac{\partial^2 z}{\partial y^2} = 0 .$$

Explain the rule for finding the particular integral of the partial differential equation :

$$f(\mathrm{D}, \mathrm{D}') = \mathrm{F}(x, y)$$

when :

$$\mathrm{F}(x, y) = x^m y^n .$$

P.T.O.

Or

(*a*) Explain the working rule of Lagrange's linear equation is an equation of type : 8

$$P_p + Q_q = R$$

(*b*) Solve : 7

$$p(1+q) = qz$$

2. Explain the Chartpit's method to solve partial differential equation :15

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

Or

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

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

by D' Alembert's method.

(*b*) Solve the wave equation :

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

such that $y = P_0 \cos pt$, (P_0 is constant) when $x = l$ and $y = 0$ when $x = 0$. 7

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

(*a*) Form a partial differential equation from :

$$x^2 + y^2 + (z - c)^2 = a^2$$

(*b*) Solve :

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

(*c*) Solve :

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

which satisfies the conditions :

$$u(0, y) = u\ (l, y) = u\ (x, 0) = 0$$

and

$$u(x, a) = \sin \frac{n\pi x}{l}.$$

(*d*) Find the general solution of :

$$\frac{\partial^2 z}{\partial x^2} + \frac{3\partial^2 z}{\partial x \partial y} + \frac{2\partial^2 z}{\partial y^2} = x + y.$$