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SB—155—2022

FACULTY OF SCIENCE

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

MAY/JUNE, 2022

(Old Pattern)

MATHEMATICS

Paper–IX

(Partial Differential Equations)

(Wednesday, 22-6-2022) **Time : 2.00 p.m. to 4.30 p.m.**

Time— 2½ *Hours* *Maximum Marks*—40

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

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

1. Discuss the method to solve Lagrange's linear equations of the type Pp Qq = R, where P, Q, R are functions of x, y, z and P = $\frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$.

From the partial differential equation :

$$z = f(x^2 + y^2).$$ 15

Or

(*a*) Solve :

$$\frac{\partial^3 z}{\partial x^3} = \cos(2x + 3y)$$ 8

(*b*) Explain the method to solve the equation of type $f(z, p, q) = 0$ equations not containing x and y. 7

P.T.O.

2. Explain the Charpit's method to solve partial differential equation with two independent variables $f(x, y, z, p, q) = 0$. 15

Or

(*a*) Explain Monge's method to solve the non-linear equation of second order :

$$Rr + Ss + Tt = V$$

Where R, S, T, V are functions of x, y, z, p and q : 8

$$r = \frac{\partial^2 f}{\partial x^2}$$

$$s = \frac{\partial^2 f}{\partial x \partial y}$$

$$t = \frac{\partial^2 f}{\partial y^2}$$

(*b*) Solve : 7

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

by the method of separation of variables.

3. Attempt any *two* of the following : 5 each

(*a*) Solve :

$$\sqrt{p} + \sqrt{q} = 1$$

(*b*) Solve :

$$\frac{2\,\partial^2 z}{\partial x^2} + \frac{5\,\partial^2 z}{\partial x \partial y} - \frac{2\,\partial^2 z}{\partial y^2} = 0$$

(*c*) Solve :

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6\frac{\partial^2 z}{\partial y^2} = y \cos x.$$

(*d*) Solve the wave equation :

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

by D' Alembert's method.