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PA—89—2024

FACULTY OF SCIENCE

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

APRIL/MAY, 2024

(New Pattern)

MATHEMATICS

Paper VIII

(Ordinary Differential Equations)

(Wednesdday, 24-04-2024) **Time : 2.00 p.m. to 4.00 noon**

Time—Two Hours *Maximum Marks*—40

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

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

(*iii*) Attempt (A) or (B) (*a*), (*b*) in Question No. **1** and **2**.

1. (A) Explain the method of finding the solution of homogeneous differential equation of the form : 15

$$\frac{dy}{dx} = \frac{f_1(x, y)}{f_2(x, y)},$$

where f_1, f_2 are expressions homogeneous and the same degree in x and y.

Also solve the non-homogeneous differential equation :

$$(3y - 7x + 7)\,dx + (7y - 3x + 3)\,dy = 0.$$

P.T.O.

Or

(B) (*a*) Define linear differential equation and solve : 8

$$\frac{dy}{dx} + y = e^{-x}.$$

(*b*) Solve : 7

$$p^3 + 2xp^2 - y^2p^2 - 2xy^2p = 0.$$

2. (A) Find the complementary function of the linear differential equation with constant coefficients P_1, P_2, ... P_n of the form : 15

$$\frac{dy^n}{dx^n} + P_1\frac{dy^{n-1}}{dx^{n-1}} + P_2\frac{dy^{n-2}}{dx^{n-2}} + ... + P_n y = X,$$

when roots of the auxiliary equation are distinct and equal.

Or

(B) (*a*) Solve : 8

$$\frac{d^3y}{dx^3} + y = 3 + e^{-x} + 5e^{2x}.$$

(*b*) Solve : 7

$$x^2\frac{dy^2}{dx^2} - x\frac{dy}{dx} + y = 2 \log x.$$

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

(*a*) Solve :

$$a(xdy + 2ydx) = xydy.$$

(*b*) Find the solution of the linear differential equation :

$$\frac{dy}{dx} + P_y = Q$$

Where P and Q are functions of x or constants.

(*c*) Find the particular integral of linear differential equation with constant coefficient corresponding to a term of the form XV in the second member.

$$\frac{d^n y}{dx^n} + P_1 \frac{dy^{n-1}}{dx^{n-1}} + P_2 \frac{dy^{n-2}}{dx^{n-2}} + \ldots\ldots\ldots + P_n y = X,$$

Where V is any function of x.

(*d*) Solve :

$$x^2 \frac{dy^2}{dx^2} + 7x \frac{dy}{dx} + 5y = x^5.$$