

This question paper contains 3 printed pages]

**NA—89—2023**

**FACULTY OF SCIENCE AND TECHNOLOGY**

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

**NOVEMBER/DECEMBER, 2023**

**(New Course)**

**MATHEMATICS**

**Paper VIII**

**(Ordinary Differential Equations)**

**(Monday, 18-12-2023)**

**Time : 2.00 p.m. to 4.00 p.m.**

*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 questions 1 and 2.*

1. Solve either (A) or (B) of the following questions :

(A) Find the solution of Clairaut's equation and also prove : 15

$$\frac{dx}{dp} = \frac{f_1'(p)}{p - f_1(p)} x + \frac{f_2'(p)}{p - f_1(p)},$$

linear in  $x$ . Solve  $x^2(y - px) = yp^2$ .

P.T.O.

Or

- (B) (a) Explain the method of solution of the equation : 8

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

homogeneous in  $x$  and  $y$ .

- (b) Solve the equation : 7

$$y^2 + xyp - x^2p^2 = 0.$$

2. Solve either (A) or (B) of the following questions :

- (A) Find the particular integral corresponding to a term  $\sin ax$  or  $\cos ax$  in the second member of the linear equation with constant coefficients and second member a function of  $x$ , 15

$$\frac{d^n y}{dx^n} + p_1 \frac{d^{n-1} y}{dx^{n-1}} + \dots + p_n y = X.$$

Also solve :

$$\frac{d^2 y}{dx^2} - 4y = 2 \sin \frac{1}{2} x.$$

Or

- (B) (a) Find the second method of solution, to find the particular integral of : 8

$$x^x \frac{d^n y}{dx^n} + p_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots + p_n y = X.$$

- (b) Solve : 7

$$\frac{d^2 y}{dx^2} - 5 \frac{dy}{dx} + 6y = e^{4x}.$$

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

(a) Solve :

$$(4y + 3x) \frac{dy}{dx} + y - 2x = 0.$$

(b) Solve :

$$(x^2 + 1) \frac{dy}{dx} + 2xy = 4x^2.$$

(iii) Solve :

$$\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = 2e^{2x}.$$

(iv) Solve :

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