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VA—89—2024

FACULTY OF SCIENCE AND TECHNOLOGY

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

NOVEMBER/DECEMBER, 2024

(New Pattern)

MATHEMATICS

Paper-VIII

(Ordinary Differential Equations)

(Saturday, 14-12-2024)

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.*

(3) *Attempt (A) or (B) (a), (b) in questions 1 and 2.*

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

(A) *Explain the method to solve the linear equation of the first order :*

$$\frac{dy}{dx} + Py = Q,$$

where P and Q are functions of x or constant, also solve :

$$\cos^2 x \frac{dy}{dx} + y = \tan x.$$

15

P.T.O.

Or

- (B) (a) Explain the method of solving the non-homogeneous differential equation of the first degree in x and y of the form : 8

$$\frac{dy}{dx} = \frac{ax + by + c}{a'x + b'y + c'}$$

- (b) Find the integrating factor by inspection of : 7

$$(1 + xy)ydx + (1 - xy)x dy = 0.$$

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

- (A) Explain the method for finding particular integral corresponding to a term of the form e^{ax} in the second member of : 15

$$\frac{d^n y}{dx^n} + P_1 \frac{d^{n-1} y}{dx^{n-1}} + \dots \dots \dots P_n y = X.$$

Also solve $\frac{d^3 y}{dx^3} - y = (e^x + 1)^2.$

Or

- (B) (a) Find the complementary function of the differential equation : 8

$$x^n \frac{d^n y}{dx^n} + P_1 x^{n-1} \frac{d^{n-1} y}{dx^{n-1}} + \dots \dots \dots P_n y = X,$$

where $P_1, P_2, \dots \dots \dots, P_n$ are constants and X is a function of x .

- (b) Solve : $2 \frac{d^2 x}{dt^2} + 5 \frac{dx}{dt} - 12x = 0.$ 7

3. Attempt any *two* of the following :

5 each

(a) Solve : $\frac{dy}{dx} + \sqrt{\frac{1-y^2}{1-x^2}} = 0$

(b) Solve : $x \frac{dy}{dx} - ay = x + 1.$

(c) Solve : $\frac{d^3y}{dx^3} - 3 \frac{d^2y}{dx^2} + 4y = 0.$

(d) Solve : $(D^3 + 3D^2 + 2D)y = x^2.$