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2 SEM TDC MTMH (CBCS) C 4

2026

(May/June)

MATHEMATICS

(Core)

Paper : C–4

(Differential Equations)

Full Marks : 60

Pass Marks : 24

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. *(a)* Write the necessary condition for the equation $M(x, y)dx + N(x, y)dy = 0$ to be an exact differential equation. 1

(b) Write the integrating factor of

$$x\frac{dy}{dx} + \frac{y}{x} = 1$$ 1

(c) Show that $y = 2e^{3x} - 5e^{4x}$ is a solution of the differential equation

$$\frac{d^2y}{dx^2} - 7\frac{dy}{dx} + 12y = 0$$ 3

(e) Answer any *one* of the following : 5

(i) If $y = \frac{1}{x}$ is a solution of

$$x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} + y = 0$$

then find the general solution.

(ii) Solve :

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 3y = 2e^{3x}$$

4. Answer any *two* from the following : 6×2=12

(a) Solve :

$$x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = \sin\log x^2$$

(b) Solve by method of undetermined coefficient :

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^{4x}$$

(c) Solve by method of variation of parameter :

$$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x$$

5. (a) Define equilibrium solution of a differential equation. 1

(b) Write the word equation and differential equation for predator-prey model. 2

(c) Find the equilibrium solution of the differential equation of epidemic model of influenza. 3

(d) Write the assumptions considered in predator-prey model. 4

Or

Draw the phase plane diagram of

$$\frac{dx}{dt} = 0\cdot 2x - 0\cdot 1xy, \quad \frac{dy}{dt} = -0\cdot 15y + 0\cdot 05xy$$

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