A–1020

Total Pages : 3 **Roll No. .....**

MAT-610

Mathematics (MSCMAT/MAMT)

Mathematical Modelling

Examination, 2026 (Feb.)

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *Two* (02) questions only.

1. Explain the procedure that is helpful to construct mathematical models.

2. Describe the limitations of mathematical models.

3. Illustrate role of differential equation in mathematical modeling.

4. Specify the importance of difference equation in mathematical modeling.

5. Discuss mathematical modeling through linear programming with example.

Section–B

Short Answer Type Questions 4×8=32

Note **:–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *Four* (04) questions only.

1. Show that triangle of given perimeter with maximum area is equilateral triangle.

2. What is the role of interest compounded continuously if a bank's rate of interest is 10% per annum.

3. Find a family of curves such that for each curve the length of the tangent intercepted between the axes is of constant length.

4. Show that the model :

$$\frac{dx}{dt} = x(12 - 4x - 3y)$$

$$\frac{dy}{dt} = y(30 - 6x - 5y), \quad x, y \geq 0$$

has no position of equilibrium.

5. Define susceptible infected susceptible model.

6. Show that the force required to make a particle of mass m move in a circular orbit of radius a with velocity v is $\frac{mv^2}{a}$ directly towards centre.

7. Solve :

$$x'' + 13x' + 36x = 0,$$

$x(0) = 1$, $x'(0) = 0$ and plot $x(t)$

8. Solve :

$$x_{n+1} - x_n + 2y_{n+1} = 0$$

and $$y_{n+1} - y_n + 2x_n = 2^n.$$

****