MAY 2024 **U/ID 32515/UEM5A**

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer any TEN questions.

1. What are the applications of mathematical models?

2. Write any one characteristics of mathematical model.

3. What is a differential equation model?

4. Find the continuous percent growth rate of $Q = -00(0.886)^t$.

5. Convert the formula $Q = 7(e^{0.3})^t$ to the form $Q = ab^{'}$.

6. What is prey-predator model?

7. Define Competition model.

8. Write the equations of SIS model with constant number of carriers.

9. How do you find the particular solution of a linear difference equation?

10. Write the difference equation of nth order.

11. What is Cobweb model?

12. Write the assumptions considered in Harrod model.

PART B — ($5 \times 5 = 25$ marks)

Answer any FIVE questions.

13. List the advantages of mathematical modeling.

14. A square bottom box without cover is made from a material that costs $ 0.75 per square metre for the sides and $ 0.95 per square metre for the bottom. Express the total cost of the material required to construct the box in function of its width and height.

15. Water is heated to 80°C for 10 min. How much would be the temperature if k = 0.056 per min and the surrounding temperature is 25°C?

16. A body where temperature T is initially 300°C is placed in a large block of ice. Find its temperature at the end of 2 and 3 minutes.

17. If the projectile is projected on a plane inclined at an angle ò to the horizontal, find the range and time of flight.

18. Solve the difference equations $X_{t+2} - 7X_{t+1} + 1 - X_t = 3^t + t^4 + 4^t t^3$.

19. Prove that the national income at different times form a geometric progression.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

20. Suppose you have a room of length 6m and breadth 5m. You want to cover the floor of the room with square mosaic tiles of side 30 cm. How many tiles will you need? Solve this by constructing a mathematical model.

21. Explain population growth model with an example.

22. Discuss the modification of the prey-predator model when

(a) the predator population is harvested at a constant rate / 1

(b) the prey population is harvested at a constant rate / 1

(c) both species are harvested at constant rates.

23. Find A_n for $A = \begin{pmatrix} 4 & 1 & - \\ 0 & - & -4 \\ 0 & 1 & 6 \end{pmatrix}$.

24. How the difference equation is applied in actuarial science? Explain.

———————