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**DHANALAKSHMI SRINIVASAN COLLEGE
OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)**



(For Candidates admitted from 2020-2021 onwards)

**PG DEGREE EXAMINATIONS APRIL – 2021
M.SC - MATHEMATICS
MATHEMATICAL MODELING**

Time: 3 Hrs

Max.Marks: 75

PART - A

CHOOSE THE CORRECT ANSWER

- According to Newton's law of cooling, the rate of change of temperature of a body is proportional to the difference between the temperature T of the body.
 - Proportional
 - multiplication
 - addition
 - Subtraction
- Simple harmonic motion, both displacement and velocity are periodic functions with Period functions with period is
 - $\frac{\sqrt{\mu}}{2\pi}$
 - $\frac{2\pi}{\sqrt{\mu}}$
 - $\frac{\pi}{\sqrt{\mu}}$
 - $\frac{\sqrt{\mu}}{3\pi}$
- If there are no prey, the predator species will decline at a rate proportional to the population of the _____ species
 - Prey
 - rates
 - Predator
 - decreases
- Let $S(t)$, $I(t)$, $Y(t)$ be the sowings, investment and national income at time, then it is assumed that sowings are proportional to national income, so that $s(t) =$
 - $\alpha I(t)$, $\alpha > 0$
 - $\beta y'(t)$, $\beta > 0$
 - $s(t) = \alpha' y(t)$, $\alpha > 0$
 - $\alpha y(t)$, $\alpha > 0$.
- Every planet describes an ellipse with the sum at _____ focus
 - two
 - three
 - one
 - four
- If $u^2 < ga$, the particle leaves contact with the wire immediately and describes a _____ path
 - parabolic
 - elliptic
 - hyperbola
 - circle
- If $S(t)$, $Y(t)$, $I(t)$ denote the sowings, national income and investment respectively. The investment depends on the difference between the income of the current year and
 - last year
 - first year
 - second year
 - none of these.
- The price of the commodity this year is a linear function of the amount available this year i.e
 - $p_i = \gamma - \delta q_i$
 - $p_i = \gamma + \delta q_i$
 - $q_i = \gamma + \delta p_i$
 - $q_i = \gamma - \delta q_i$

9. A signed or an algebraic graph is one in which every edge has a or sign associated with it.
a) Positive b) negative c) positive or negative d) Zero
10. A graph is called _____ if every pair of its vertices is joined by an edges.
a) Tree b) circuit c) complete d) Euler

PART – B

ANSWER ALL THE QUESTIONS:-

(5 X 7 = 35)

11. a) Explain population growth models

(OR)

b) Explain simple Geometrical problems

12. a) Discuss allen's speculative model.

(OR)

b) Prove that the equilibrium will be stable if all the eigen values of the matrix E have negative real parts.

13. a) Explain motion under a central force.

(OR)

b) Derive the correspondence between mechanical and electrical systems.

14. a) Explain solution of linear difference equations by using Laplace transform

(OR)

b) Write about two – period fixed points and their stability.

15. a) Discuss about one-way traffic problems.

(OR)

b) Derive the Euler's formula for polygonal graphs.

PART – C

ANSWER ANY THREE QUESTIONS:-

(3 X 10 = 30)

16. Discuss briefly diffusion of glucose or a medicine in the blood stream.

17. Explain briefly multi – species models.

18. Explain motion of a particle on a smooth or rough vertical wire.

19. Explain mathematical modeling through difference equations in genetics for improvement of plants through elimination of recessives.

20. Describe about weighted digraphs and Markov chains with an example.