Math - 3.4

Sl.No. : **Total No. of Pages : 2**

III Semester M.Sc. Degree Examination, May/June - 2023
(Non - CBCS, SLM Scheme)
MATHEMATICS
Mathematical Modeling

Time : 3 Hours **Max. Marks : 80**

Instructions: ***1)*** ***Answer any five full questions.***
2) ***All questions carry equal marks.***

Q1) a) Explain the needs of mathematical modeling with few examples.

b) Explain ten characteristics of mathematical modeling.

[6+10]

Q2) a) What are the limitations of mathematical modeling?

b) For the given differential equation $\frac{dx}{dt} = 2\cos(\pi x)$ find all equilibria and determine the stability of those equilibria.

c) Explain linear growth and decay models.

[4+4+8]

Q3) a) Explain the construction of spring and dashpot systems. Find the expression for the displacement at any time 't'.

b) Set up a differential equation model to describe age structured population.

[10+6]

Q4) a) Describe conventional combat model in detail.

b) Briefly explain elliptic motion of satellite.

[8+8]

Q5) a) Obtain Euler's equations of motion for inviscid fluid flow.

b) Describe a partial differential equation model for birth-death-immigration process.

[8+8]

Q6) a) Derive Burger's equation for the convection diffusion process.

b) Explain the asymptotic behaviour of the exact solution of the Burger's equation.

[8+8]

Q7) a) What are the components of air pollution? Distinguish between primary and secondary air pollutants.

b) Brief on :

i) Natural contaminants

ii) Aerosols

iii) Dust

iv) Smoke

[8+8]

Q8) a) What is Suspended Particulate Mathes (SPM)? What are the effects of SPM on health, Climate and vegetables?

b) Give the mathematical formulation for SPM in Taylor Dispersion model.

[8+8]

