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SEVENTH SEMESTER **B.Tech. [MC]**

SUPPLEMENTARY EXAMINATION Feb. 2019

MC409, Mathematical Modeling and Simulation

Time: 3.0 Hours Max. Marks: 40

Note: *Attempt* ***ANY*** *eight questions. All questions carry equal marks. Assume suitable missing data, if any.*

1. Give a short note on Mathematical modeling and its purpose and uses.
2. For the data set below, determine if it is reasonable to assume that y is inversely proportional to x. If it is, approximate the constant of proportionality. If it is not, describe why this assumption is not reasonable.

x :	1	1.2	1.4	1.6	1.8	2
y :	6.85	6.21	4.24	4.32	3.92	3.18

3. For the given set of data, fit a quadratic function:

x :	-2	-1	0	1	2
y :	15	1	1	3	19

4. Discuss and drive cubic splines.
5. Discuss linear predator prey model.
6. Solve the mathematical model and discuss its stability.

$$\frac{dx}{dt} = ax + by \ ; \ \frac{dy}{dt} = cx + dy$$

7. Discuss Volterra's principle and Lanchester combat model.
8. Solve the difference equation:

$$y_n - 8y_{n-1} + 21y_{n-2} - 18y_{n-3} = 0$$

9. Discuss SIR continuous model.
10. Discuss Markov chain with an example.