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MCSE-302(D)

M.E./M.Tech., III Semester Examination, June 2020 Simulation and Modeling

(Elective-II)

Time: Three Hours

Maximum Marks: 70

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Note: i) Attempt any five questions.

- ii) All questions carry equal marks.
- 1. a) What is the difference between static and dynamic models? Give an example of a dynamic mathematical model.
 - b) Describe the stages of a simulation project.
- 2. a) Give expressions for Binomial, Poisson and Normal distributions. Under what conditions Binomial distribution is approximated by Poisson distribution?
 - b) The distribution function for a random variable *x* is:

$$F(x) = \begin{cases} 3 - e^{-x}, & x \ge 0 \\ 0, & x < 0 \end{cases}$$

Find

- i) Probability density function
- ii) P(x>z)
- iii) Probability Probability $x \le 4$
- 3. a) Describe a general queuing system with illustrative diagrams. How a queuing system can be simulated? List out its various applications in operating system and computer networks. 7
 - b) Consider an M/M/I queuing system.
 - i) Find a closed formula for $Pr[T(t) \ge k]$.
 - ii) Find the maximum allowable rate in a system with service rate μ if it is required that $\Pr[T(t) \ge 5] = 0.01$.
- 4. Arrival times of print jobs in a resource sharing computer system are specified as a Poisson process at the rate of 80 print jobs per hour.
 - i) Write an expression for the Probability mass function (pmf) Pr[T(t)=k], where k is the system state.
 - ii) Find the probability density function $f_T(t)$ describing the distribution of the inter-event times T_k .

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5.	a)	Discuss in detail the exponential growth and decay models using its curve diagrams and	l
		equations.	7

b) What are random numbers? What are their properties? List out different techniques for generating random numbers.

6. Write short notes on following:

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- i) Causal loop diagrams
- ii) Stock and flow diagrams
- 7. a) How would you compare two simulation models?
 - b) Describe some basic features of SIMULA language? How it is used in system modelling? 7
- 8. a) State out the difference between Verification and Validation of experimental models. 7
 - b) Describe some basic features of STELLA language? How it is used in system modelling.7

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