MCSE-302(D)

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

(Elective-II)

Time : Three Hours

Maximum Marks : 70

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.   7

   b)   Describe the stages of a simulation project.   7

2. a)   Give expressions for Binomial, Poisson and Normal distributions. Under what conditions Binomial distribution is approximated by Poisson distribution?   7

   b)   The distribution function for a random variable x is: 7

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

     Find

     i)   Probability density function

     ii) $P(x > z)$

     iii)   Probability $P(-3 < x \leq 4)$

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/1 queuing system.   7

     i)   Find a closed formula for $Pr[T(t) \geq k]$.

     ii)   Find the maximum allowable rate in a system with service rate μ if it is required that $Pr[T(t) \geq 5] = 0.01$.

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.   14

   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 $f_r(t)$ describing the distribution of the inter-event times T_k.

5. a) Discuss in detail the exponential growth and decay models using its curve diagrams and equations. 7
   b) What are random numbers? What are their properties? List out different techniques for generating random numbers. 7

6. Write short notes on following: 14
   i) Causal loop diagrams
   ii) Stock and flow diagrams

7. a) How would you compare two simulation models? 7
   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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