CBCS SCHEME

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15CS834

Eighth Semester B.E. Degree Examination, Jan./Feb. 2021
System Modeling and Simulation

Time: 3 hrs. Max. Marks: 80

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define system, system environment and its components with an example for each. **(08 Marks)**

b. What are the phases of simulation model building process and explain them with suitable diagram in brief with steps involved in it. **(08 Marks)**

OR

2 a. Explain time advanced algorithm. Draw flow chart of arrival event which is suitable for time advanced algorithm. **(08 Marks)**

b. A company user 6 trucks to haul manganese ore from a place to industry. There are 2 loaders, to 5 load each truck. After loading a truck moves to the weighing scales to be weighed. The queue discipline is FIFO. When it is weighed, a truck travels to the industry and returns to the loads queue. The distribution of loading time weighing time and travel time are as follows :

Loading time	10	5	5	10	15	10	10
Weighing time	12	12	12	16	12	16	
Travel time	60	100	40	40	80		

Calculate the total busy times of both loaders, the scale, average loaders and scale utilization. Assume 5 trucks are at the loader and one is at the scale at time "0". Stopping event time TE = 20 min. **(08 Marks)**

Module-2

3 a. Explain following in brief :
i) Discrete random variable
ii) Continuous random variables
iii) Cumulative distribution function
iv) Expectation. **(08 Marks)**

b. Describe Weibull distribution. The time to failure for a component screen is known to have a Weibull distribution with V = 0, $\beta = \frac{1}{3}$ and α = 200hrs. Find meantime to failure and the probability that a unit fails before 2000 hrs. **(08 Marks)**

OR

4 a. Draw simple queuing model. What are the characteristics of queuing system, describe them briefly. **(10 Marks)**

b. List and steady state parameters of the M/M/1 queue. **(06 Marks)**

Module-3

5 a. Generate and random numbers when $m = 10^2$, a = 19, c = 0 and $X_0 = 63$. **(06 Marks)**

b. The sequence of random numbers 0.54, 0.73. 0.98, 0.11 and 0.68 has been generated. Use KS test with α = 0.05 to determine of the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. Take $D_\alpha = 0.565$. **(10 Marks)**

OR

6 a. Explain inverse transform technique for exponential distribution. **(08 Marks)**

b. Downtimes for a high–production candy-making machine have been found to be gamma distributed with mean 2.2 minutes and various 2.10 minutes^2. Generate gamma variates using random number 0.832, 0.021, 0.434 and 0.716. **(08 Marks)**

Module-4

7 a. Write steps to construct histogram. **(06 Marks)**

b. Test whether the following data follows Poisson distribution using the chi-squares test of goodness of fit. With mean $\alpha = 0.05$. Take $\lambda^2_{0.05,5} = 11.1$.

Arrivals/period	0	1	2	3	4	5	6	7	8	9	10	11
Frequency	12	10	19	17	10	8	7	5	5	3	3	1

(10 Marks)

OR

8 a. What are the measures used for linear dependence between 2 random variables? Describe them with suitable formula. **(10 Marks)**

b. Define, terminating simulation, transient simulation and steady state simulation. **(06 Marks)**

Module-5

9 a. From 25 replications of the manufacturing simulation, a 90% confidence interval for the daily average W/P is 218 ± 32. What is the probability that the daily average W/P is less than 350? What is the 85th percentile of daily average W/P? (Use $P_r(z \leq 1.42) = 0.92$ and $z_{0.85} = 1.04$). **(08 Marks)**

b. Explain replication method for steady state simulation. **(08 Marks)**

OR

10 a. Explain briefly with neat diagram model building, verification and validation processes. **(08 Marks)**

b. Describe the 3 steps approach of Naylor Finger in the validation process. **(08 Marks)**

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