CBCS SCHEME

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15CS834

Eighth Semester B.E. Degree Examination, Feb./Mar. 2022
System Modelling and Simulation

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. What is simulation? Explain different steps involved in simulation study with neat flowchart. **(08 Marks)**

b. A grocery store has only one checkout counter. Customer arrives at this counter at random times that are from 1 to 8 minutes apart and each interval time has the same probability of occurrences. The service time vary from 1 to 6 minutes with probabilities give below :

Service (minutes)	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Simulate the arrival for 10 customers and calculate :

i) Average waiting Time
ii) Probability of Idle server
iii) Average service time

The random digits for arrivals are : 913, 727, 015, 948, 309, 922, 753, 235, 302
Random digits for service time are : 84, 10, 74, 53, 17, 79, 91, 67, 89, 38. **(08 Marks)**

OR

2 a. Explain the terms used in discrete event simulation with an example.
i) Event ii) Entity iii) Attribute iv) Activity. **(04 Marks)**

b. A company uses 6 trucks to haul iron form Kolar to industry. There are two loaders, to load each truck, After loading, a truck moves to the weighing scale to be weighed. The Queue discipline is FIFO. When it is weighed, a truck travels to the industry and return to the loader Queue. The distribution of loading time, weighing time and travel time one as follows :

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

Depict the simulation table and estimate the loader and scale utilization. Assume 5 trucks are at the loaders and one is at the scale, at time '0' stopping time $T_E = 54$ min. **(12 Marks)**

Module-2

3 a. Explain discrete random variable and continuous random variable. **(06 Marks)**

b. Explain the following distributions
i) Binomial Distribution
ii) Uniform Distribution. **(10 Marks)**

OR

4 a. List Queuing notations for parallel server systems. **(08 Marks)**

b. Explain Steady state parameters of M/G/1 Queue. **(08 Marks)**

Module-3

5 a. Generate three 2-digit random numbers with $X_0 = 63$, $a = 19$, $c = 0$ and $m = 100$. **(06 Marks)**

b. The sequences of numbers are 0.54, 0.73, 0.98, 0.11 and 0.68 has been generated. Use the Kolmogorov – Smirnov test with $\alpha = 0.05$, test whether the hypothesis that the numbers are uniformly distributed on the interval [0, 1] can be rejected. Assume $D_\alpha = 0.565$. **(10 Marks)**

OR

6 a. Generate three Poisson variates with mean $\alpha = 0.2$ for the random numbers R = 0.4357, 0.4146, 0.8353, 0.9952, 0.8004. **(08 Marks)**

b. Discuss the concept of inverse transform technique to generate random numbers using exponential distribution. **(08 Marks)**

Module-4

7 a. Explain data collection in input modeling. What are the suggestions which may enhance and facilitate data collection? **(08 Marks)**

b. Explain Chi-Square goodness of fit test. Apply it to Poisson assumptions with $\alpha = 3.64$. Data size = 100 and observed frequency O_i = [12, 10, 19, 17, 10, 8, 7, 5, 5, 3, 3, 1]. Assume $\chi^2_{0.05,5} = 11.1$. **(08 Marks)**

OR

8 a. Explain multivariate input model and Time series input model. **(06 Marks)**

b. Discuss the concept of measures of performance and their estimation. **(10 Marks)**

Module-5

9 a. Explain output analysis for terminating simulation. **(06 Marks)**

b. Explain output analysis for steady state simulation. **(06 Marks)**

c. Explain concept of Quantitiles in detail. **(04 Marks)**

OR

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

b. Explain three step approaches for validation process formulated by Nayler and Finger. **(08 Marks)**

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