QP Code:729103

(3 Hours)   **Total Marks :80**

1. Question No. **1** is **compulsory**.
2. Out of remaining 5 questions, attempt any **three** questions.
3. Assume **suitable** data wherever required but **justify** the same.
4. **All** questions carry **equal** marks.
5. Answer to each new question to be started on a fresh page.
6. **Figure** to the **right** in brackets indicate **full** marks.
7. Use of statistical table is allowed.

Q1. Solve the followings.

(a) Define simulation. What are the various steps in simulation study? Explain each of them. Draw the flowchart of the same.   **(10)**

(b) Consider a single server system. Let the arrival distribution be uniformly distributed between 1 and 10 minutes and the service time distribution is as follows -

Service Time (min)	1	2	3	4	5	6
Probability	0.04	0.20	0.10	0.26	0.35	0.05

Develop the simulation table and analyze the system by simulating the arrival and service of 10 customers. Random digits for interarrival time and service time are as follows.

Customer	1	2	3	4	5	6	7	8	9	10
R.D. for Interarrival Time	---	853	340	205	99	669	742	301	888	444
R. D. for Service Time	71	59	12	88	97	66	81	35	29	91

Also calculate server utilization and maximum queue length.   **(10)**

Q2. Solve the followings.

(a) Explain the dump trucks problem in detail.   **(10)**

(b) Explain the replication method for steady state simulation.   **(10)**

Q3. Solve the followings.

(a) The interarrival times as well as service time at a single-chair unisex barbershop have been shown to be exponentially distributed. The values of λ and μ are 4 per hour and 6 per hour, respectively. Compute the steady-state parameters and the probabilities for zero, one, two, three, and four or more customers in the shop. **(10)**

(b) Explain Poisson process and state its properties.   **(10)**

[Turn Over]

Q4. Solve the followings.

    (a) Design a generator for weibull distribution. Using this generator get a weibull variate for $\alpha = 8$, $\beta = 0.75$, $\nu = 0$, and $R = 0.612$. **(10)**

    (b) Explain in detail the tree step approach of Naylor and Finger in the validation process. **(10)**

Q5. Solve the followings.

    (a) State the properties of random numbers. What are the problems or errors than can occur while generating pseudo random numbers? Use the mixed congruential method to generate a sequence of three two-digit random integers between 0 and 24 with $X_0 = 13$, $a = 9$, and $c = 35$. **(10)**

    (b) Discuss the various issues in manufacturing and material handling system's simulation. **(10)**

Q6. Solve the followings.

    (a) Explain the time series input models. **(08)**

    (b) The highway between Mumbai, Delhi, and Calcutta, Delhi, has a high incidence of accidents along its 100 kilometers. Public safety officers say that the occurrence of accidents along the highway is randomly (uniformly) distributed, but the news media say otherwise. The Delhi Department of Public Safety published records for month of June. These records indicated the point at which 30 accidents involving an injury or death occurred as follows (the data points represent the distance from the city limits of Mumbai):

88.3	40.7	36.3	27.3	36.8	91.7	67.3	7.0	45.2	23.3
98.8	90.1	17.2	23.7	97.4	32.4	87.8	69.8	62.6	99.7
20.6	73.1	21.6	6.0	45.3	76.6	73.2	27.3	87.6	87.2

       Use the Kolmogorov-Smirnov goodness of fit test to determine whether the distribution of location of accidents is uniformly distributed for the month of June. Use a level of significance of $\alpha = 0.05$. **(12)**

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