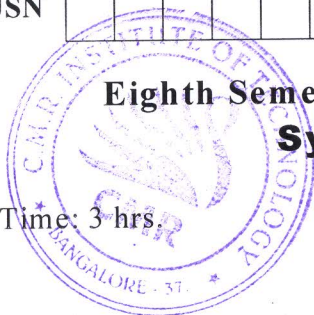


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**Eighth Semester B.E. Degree Examination, Dec.2018/Jan.2019**  
**System Modeling and Simulation**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting atleast TWO questions from each part.**

**PART – A**

- 1 a. With a neat flow diagram, explain the steps in simulation study. (10 Marks)
- b. A small grocery store has one checkout counter. Customer arrives at this checkout counter at random from 1 to 8 minutes apart. Each possible value of interarrival time has the same probabilities of occurrences. The service times vary from 1 to 6 minutes with the probabilities shown below :

|              |      |      |      |      |      |      |
|--------------|------|------|------|------|------|------|
| Service time | 1    | 2    | 3    | 4    | 5    | 6    |
| Probability  | 0.10 | 0.20 | 0.30 | 0.25 | 0.10 | 0.05 |

Simulate the arrival and service of 6 customers and estimate :

- Average waiting time
- Average service time
- Probability of idle server.

Note : Random digits for interarrival time : 913, 727, 015, 948 and 309

Random digits for service time : 84, 10, 74, 53, 17 and 76.

- 2 a. Write and explain event scheduling /time advance algorithm with an example. (10 Marks)
- b. What is world view? Briefly explain different world views. (10 Marks)
- 3 a. Explain the following continuous distributions :  
 i) Exponential distribution ii) Normal distribution. (10 Marks)
- b. Given the following distribution : Normal (10, 4), uniform(4, 16) triangular(4, 10, 16). Find the probability that  $6 < x < 8$  for each of the distribution note :  
 $\phi(-1) = 0.1587$  ;  $\phi = (2) = 0.0228$ . (06 Marks)
- c. Forty percent of the assembled ink-jet printers are rejected at the inspection station.  
 i) Find the probability that the first accepted ink-jet printer is the third one inspected.  
 ii) Determine the probability that the third printer inspected if the second acceptable printer. (04 Marks)
- 4 a. Explain in detail the characteristics of queuing system. (10 Marks)
- b. State and explain the Kendal's notation of queuing system. (05 Marks)
- c. List the steady state parameters of M|G|1 queue. (05 Marks)

**PART – B**

- 5 a. Discuss the properties that an ideal random number generation routine should satisfy. (05 Marks)
- b. Generate five numbers of a random sequence using multiplicative congrential method with  $x_0 = 2$ ,  $a = 13$  and  $m = 64$ . (05 Marks)
- c. Give the steps to derive an expression for generating random variates that if uniformly distributed on the interval  $[a, b]$  using inverse transformation technique. Generate exponential random variates with mean 1 for the following random numbers 0.1306, 0.0422, 0.6597, 0.7965, 0.7696. (10 Marks)

- 6 a. Explain the steps in the development of a useful model of input data. (12 Marks)
- b. Recorder pertaining to the monthly number of job related injuries at an underground coalmine were being studied by federal agency. The values for the past 100 months were as following :

|                         |    |    |    |   |   |   |   |
|-------------------------|----|----|----|---|---|---|---|
| Injuries per month      | 0  | 1  | 2  | 3 | 4 | 5 | 6 |
| Frequency of occurrence | 35 | 40 | 13 | 6 | 4 | 1 | 1 |

Apply the chi-square test to these data to left the hypothesis that the underlying distribution is Poisson. Use the level of significance  $\chi_{\alpha, k-s-1}^2 = 5.99$  (08 Marks)

- 7 a. Why is optimization via simulation difficult? What compromises are normally made during that process? (10 Marks)
- b. Explain the following :  
 i) Point estimation  
 ii) Confidence interval estimation. (10 Marks)
- 8 a. With a neat diagram, explain model building, verification and validation. (08 Marks)
- b. Explain the three step approach for validation process as formulated by Nayler and finger? (12 Marks)

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