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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 :

- i) Average waiting time
 ii) Average service time
 iii) 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.

(10 Marks)

- 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 :
 $\phi(-1) = 01587$; $\phi = (2) = 0.0228$. (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)



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- 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)
