

2053  
B.E. (Computer Science and Engineering)  
Sixth Semester  
CS-603: Modeling and Simulation

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

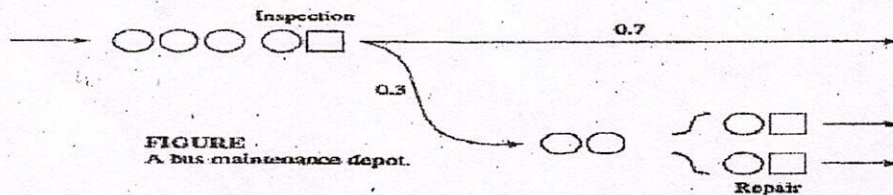
X-X-X

1Q:

- Which distribution is used to represent an activity where most of the events take place in a relatively short time, while there are a few which take very long times? (1 Marks)
- Briefly justify the statement that in Chi-Square test, uniformity test of random numbers is only a necessary test for randomness but not sufficient one. (1 Marks)
- Briefly explain the basic difference between exogenous and endogenous activities? (1 Marks)
- What is purpose of Library routine and Timing routine in next event time advance approach? (1 Marks)
- Briefly explain the difference between Clear and Reset statement of GPSS. (1 Marks)
- Customers arrive at random to a license bureau at a rate of 50 customers/hour. Presently there are 20 clerks, each serving 5 Customers/hour on average. Calculate the average utilization of a server. (1 Marks)
- Briefly Explain, the difference between ftell and frewind functions in MATLAB with their syntax. (1 Marks)
- Generate three random variates from Uniform distribution between -30 and 40. (Take three random numbers as 0.396, 0.582, and 0.556). (1 Marks)
- List different Control statements of GPSS. (1 Marks)
- What is Vectorization in MATLAB? (1 Marks)

Part-A

2Q. City buses arrive to the maintenance facility with exponential inter-arrival times with mean 2 hours. The facility consists of a single inspection station and two identical repair stations. Every bus is inspected, and inspection times are distributed uniformly between 15 minutes and 1.05 hours; the inspection station is fed by a single FIFO queue. Historically, 30 percent of the buses have been found during inspection to need some repair. The two parallel repair stations are fed by a single FIFO queue, and repairs are distributed uniformly between 2.1 hours and 4.5 hours.



Simulate the above problem using event diagram. Identify system state variables entities and events by giving proper reasons. Draw and explain an event graph for the problem, Draw flow chart diagrams for events identified. Run the simulation for 160 hours. Also and compute the average delay in each queue, the average length of each queue, the utilization of the inspection station, and the utilization of the repair station (defined to be half of the time-average number of busy repair stations, since there are two stations).. (10 Marks)

- Explain event elimination rule of discrete event simulation with help of suitable example. (5 Marks)
- Explain how the value of  $\Pi$  can be calculated using Monte Carlo Simulation. (5 Marks)

4Q. A simple telephone system has two external lines. Calls, which originates externally, arrive every  $100 \pm 60$  seconds. When the lines are occupied, the caller tries a redial once after  $5 \pm 1$  minutes have elapsed. No more redials are attempted. Call duration is  $3 \pm 1$  minutes.

Identify entities, state variables and events in the system giving reasons. Draw and explain event graph for the discrete event model of above telephone system. Also develop flow chart diagrams for the event routines identified by you. (10 Marks)

Part-B

5Q.a) The following values show the distribution of digits in numbers chosen at random from a telephone directory:

| Digits    | 0    | 1    | 2   | 3   | 4    | 5   | 6    | 7   | 8   | 9   | Total  |
|-----------|------|------|-----|-----|------|-----|------|-----|-----|-----|--------|
| Frequency | 1026 | 1107 | 997 | 966 | 1075 | 933 | 1107 | 972 | 964 | 853 | 10,000 |

Test whether digits may be taken to occur equally frequently in the directory using Chi-Square Test. (The table value of Chi-Square for 9 degree of freedom at 5% level of significance is 16.92). (5 Marks)

- Explain different Transaction Flow Modification oriented blocks of GPSS with examples. (5 Marks)
- Generate random numbers from mid square method with four digit seed 2061 by assuming the stopping condition as formation of a cycle or converging to a constant or 0. (5 Marks)
  - Write a function in MALAB for generation of random variates following Binomial distribution. (5 Marks)
- Explain features and usage of any Network Simulator (5 Marks)
  - Write a MATLAB program that opens a user specified file for reading and reads the data from file into  $10 \times 10$  array in 32 bit floating point format and closes the file. It then opens the same file for writing only and writes the same  $10 \times 10$  array to file in 32 bit floating point format. (5 Marks)



