

Printed Pages : 4

Roll No. May-2016

(ii) Questions : 7

Sub. Code : 

6	8	2	0
---	---	---	---

Exam. Code : 

0	9	1	8
---	---	---	---

**B.Engg. (Computer Science and Engineering) 6<sup>th</sup> Semester**

**1046**

**MODELING AND SIMULATION**

**Paper : CSE-615**

**Time Allowed : Three Hours]**

**[Maximum Marks : 50**

**Note :** There are 7 questions in question paper of equal marks. First question is compulsory. Rest of paper is divided into two Parts (Part A and Part B) having three questions each. Candidates are required to attempt at least two questions each from Part A and Part B. First question is compulsory.

1. (a) What is significance of strongly connected event graph in event initialization rule? 1
- (b) Give difference between help and look for functions in MATLAB with example. 1
- (c) 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
- (d) Briefly explain two limitations of MATLAB JIT (Just in Time) Compiler. 1
- (e) 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

6820/BIK-569

1

[Turn over

iii. three-principal-values of  $A$  are  $\lambda_1, \lambda_2, \lambda_3$ .  
(b) Derive the three-dimensional transformation matrix for scaling by the direction cosines  $\alpha, \beta$ , and  $\gamma$ .



- (f) What is purpose of event routine in next event time approach ?
- (g) What is difference between arithmetic and floating point variables in GPSS ?
- (h) List different Transaction Flow Modification blocks of GPSS.
- (i) Briefly explain event elimination rule in event diagram.
- (j) 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.

#### PART-A

2. A fleet of trucks is used to haul coal from a mine to a railway station. Each truck is loaded by one of three loaders. After loading, the truck moves, in negligible time, to a weighing machine for getting the weight recorded. The queues at loaders and weighing machine follow FCFS (First come first serve) discipline. After weighing, the truck travels toward the station and joins a queue for unloading at the station. After unloading, it travels back to join the loading queue at coal mine. Simulate the problem using event diagram. Identify system state variables, entities and events by giving proper reasons. Draw and explain an event graph for problem. Also draw flow chart diagrams for events identified.
3. A manufacturing system consists of five work stations, and at present stations 1, 2, ..., 5 consist of 3, 2, 4, 3 and 1 identical machine(s) respectively. In effect the system is a network of five multiserver queues. Assume that jobs arrive at the system with interarrival times that are IID exponential random variables with mean 0.25 hour. There are three types of jobs, and arriving jobs are of type 1, 2 and



with respective probabilities 0.3, 0.5 and 0.2. Job types 1, 2 and 3 require 4, 3 and 5 tasks to be done respectively and each task must be done at a specified station and in a prescribed order. The routings for different job types are :

Job Type	Work stations in routing
1	3, 1, 2, 5
2	4, 1, 3
3	2, 5, 1, 4, 3

If a job arrives at a particular station and finds all the machines in that station already busy, the job joins a single FIFO queue at that station. The mean service times for each job type and each task are random.

Assuming no loss of continuity between successive days operations of the system, Simulate the system for 365 eight hour days and estimate the expected average total delay in queue (exclusive of service times) for each job type and the expected overall average job total delay. Identify state variables and events in the system giving reasons. Draw and explain event graph of above system. Also develop flow chart diagrams for event routines identified by you.

4. (a) For Single Server Queuing System Inter arrival and Service times are given below :

Inter arrival times  $A_1 = 0.4, A_2 = 1.2, A_3 = 0.5, A_4 = 1.7, A_5 = 0.2, A_6 = 1.6, A_7 = 0.2, A_8 = 1.4, A_9 = 1.9, \dots$  and Service times are  $S_1 = 2.0, S_2 = 0.7, S_3 = .2, S_4 = 1.1, S_5 = 3.7, S_6 = 0.6, \dots$

$L(t)$  is total number of customers in system at time  $t$  and  $Q(t)$  is number of customers waiting in queue at time  $t$ . Simulation will be over at time  $T(6) = 8.6$  which is time required to measure six delays:

- Calculate arrival times and departure times. 2
- Make a Plot of  $L(t)$  vs.  $t$  between times 0 and  $T(6)$ . 1



- (iii) Compute time average number of customers in the system during the time interval  $[0, T(6)]$ . (iii)
- (b) Explain how value of  $\Pi$  can be calculated using Monte Carlo Simulation with example. 5

### PART-B

5. (a) The Theory predicts the proportion of beans, in the four groups A, B, C and D should be  $9 : 3 : 3 : 1$ . In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experiment result support the theory that there is no difference between experimental values and theoretical values ? (The table value of Chi-Square for 3 degree of freedom at 5 % level of significance is 7.81). 6
- (b) Explain different Control statements of GPSS with examples. 4
6. (a) Generate random numbers using Mid-Square Random Number Generator for seed 3567 by assuming formation of cycle as stopping condition. 5
- (b) What is Vectorization in MATLAB ? Explain its benefits with example. 5
7. (a) 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
- (b) Explain features and usage of any Network Simulator. 5