Reg. No. :

V 4606

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2008.

Fifth Semester

Mechatronics Engineering

MH 1303 — MODELING AND SIMULATION

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Use of Statistical Tables Permitted

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Distinguish between discrete and continuous systems.

2.   Identify the entities, attributes, activities, events and state variables for banking system.

3.   Obtain the expected value and the variance of the random numbers.

4.   How do you achieve speed and efficiency while using the random number generator on a digital computer?

5.   Given the pdf $f(x) = \dfrac{x^2}{9}$ on $0 \le x < 3$, develop a generator for this distribution.

6.   What is meant by random variate generation?

7.   List the various steps in the development of a useful model of an input data.

8.   State the physical basis of Poisson distribution.

9.   Explain any two features that are relevant when selecting simulation software.

10.   Differentiate between the usage of GPSS and SIMSCRIPT language.

PART B — (5 × 16 = 80 marks)

11. (a) The distribution of time between arrivals of customer and the service time distribution is as follows :

Time between Arrivals (minutes)	1	2	3	4	5
Probability	0.10	0.20	0.35	0.20	0.15

Service Time (minutes)	1	2	3	4	5	6
Probability	0.10	0.20	0.30	0.25	0.10	0.05

Develop the simulation table and the analysis for 20 customers (Assume random nos of your choice).

Or

(b) The distribution of number of customers/day and the number of dozens ordered/customer in a bangle shop is as follows :

No. of Customers/day	8	10	12	14
Probability	0.35	0.30	0.25	0.10

No. of Dozens ordered/customer	1	2	3	4
Probability	0.4	0.3	0.2	0.1

Bangles sell for Rs. 50 per dozen. They cost Rs. 38 per dozen to make. All bangles not sold at the end of the day are sold at half the price to a local grocery store. Develop the simulation table and the analysis for 5 days, assuming 15 dozes of bangles are baked everyday (Assume random nos of your choice).

12. (a) (i) Explain the runs up and runs down test for testing the independence of random numbers. (8)

   (ii) Use the linear congruential method with $\chi_0 = 27$, $a = 8$, $c = 47$ and $m = 100$, to generate a sequence of three two-digit random integers. (8)

Or

(b) (i) Develop the poker test for four digit numbers. (8)

   (ii) The sequence of numbers 0.54, 0.37, 0.98, 0.11 and 0.68 has been generated. Use the Kolmogorov Smirnov test to determine the uniformity of numbers. Given critical value of D is 0.565. (8)

13. (a) (i) Develop a random variate generator for a triangular distribution with range (1, 10) and mode at $x = 4$. (8)

(ii) Describe a random variate generator for discrete distribution with pmf given by $p(x) = \dfrac{2x}{k(k+1)}$, $x = 1, 2, \ldots\ldots k$. (8)

Or

(b) Describe the acceptance - rejection technique for the generation of random variates for the Poisson distribution. Generate three Poisson variates with mean 0.3.

14. (a) Assume that you are provided with 50 observations. Describe Kolmogorov-Smirnov method to test the hypothesis that these observations are exponentially distributed.

Or

(b) Describe the techniques available for validation of simulation models.

15. (a) Describe the usage of Arena package in the development of simulation model in solving single channel queuing problem.

Or

(b) Describe the usage of Arena package in the development of simulation model in solving inventory problem.