Register No: ……

B.E DEGREE EXAMINATIONS: APRIL/MAY 2011

Sixth Semester

MECHATRONICS ENGINEERING

U07MHE03: Modeling and Simulation

Time: Three Hours **Maximum Marks: 100**

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Random number generators have applications in

(a) Computer simulation (b) Signal processing (c) Image processing (d) Military applications

2. The generation of ---------- is an important and common task in computer programming.

(a) Pseudo-random numbers (b) Machine level language

(c) Assembly level language (d) Compiler design

3. Which one of the following is the method of random variate generation?

(a) Inversion method (b) Rungekutta method (c) Montecorla method (d) Chi square test

4. The process of comparing the model's output with the behavior of the phenomenon

(a) Validation (b) Verification (c) Calibration (d) Optimization

5. Which one of the following is not modeling and simulation software?

(a) CSIM (b) MODELSIM (c) TIERRA (d) GPSS

6. Which of the following is NOT an assumption of the Binomial distribution?

(a) All trials must be identical.

(b) All trials must be independent.

(c) Each trial must be classified as a success or a failure.

(d) The number of successes in the trials is counted.

(e) The probability of success is equal to .5 in all trials.

7. The number of traffic accidents per week in a small city has Poisson distribution with mean equal to 3.

What is the probability of at least one accident in 2 weeks?

(a) 0.0174 (b) 0.9502 (c) 0.9975 (d) 0.1991 (e) 0.0025

8. Which of the following is not a necessary assumption underlying the use of the Analysis of Variance technique?

(a) The samples are independent and randomly selected.

(b) The populations are normally distributed.

(c) The variances of the populations are the same.

(d) The means of the populations are equal.

9. A random sample of 15 people is taken from a population in which 40% favour a particular political stand.

What is the probability that exactly 6 individuals in the sample favour this political stand?

(a) 0.4000 (b) 0.5000 (c) 0.4000 (d) 0.2066 (e) 0.0041

10. FIFO is also known as

(a) First come first serve (FCFS) (b) Fan in fan out

(c) Formula in formula out (d) First in last out

PART B (10 x 2 = 20 Marks)

11. State any two applications of simulation.
12. Differentiate discrete and continuous system using examples.
13. Find the mean for 20,34,50,20,45,30,67,87,12,10.
14. When the K-S test is used?
15. Write the significance of chi-square test.
16. What is Random variate?
17. Give expression to generate Uniform random variates.
18. What is the use of histogram in identifying the distribution?
19. Define calibration process of a model.
20. What is the need of integration formula?

PART C (5 x 14 = 70 Marks)

21. a) (i) Draw a flow chart describing the steps of simulation study. (7)

(ii) Describe the components of a simulation system using Three different examples.(7)

(OR)

b) Construct a table of inter arrival times, service times for 10 customers for a single server queue.

Calculate average of non zero wait times, average idle time of server, average queue length.

Assume times so that all of the above statistics are non zero.

22. a) Consider the simulation of a management game. There are three players A, B & C. Each player has two strategies which they play with equal probabilities. The players select strategies independently.

The following table gives the payoff:

Strategies	A's Payoff	B's Payoff	C's Payoff
A1-B1-C1	10	-5	5
A1-B1-C2	0	8	2
A1-B2-C2	9	3	-2
A1-B2-C2	-4	5	9
A2-B1-C1	6	1	3
A2-B1-C2	0	0	10
A2-B2-C1	6	10	-6
A2-B2-C2	0	4	6

Simulate 10 plays and determine the payoffs. Show your working in the form of a table with all the details including the random numbers used.

(OR)

b) (i) Perform runs test on the following sequence of numbers:

0.08, 0.09, 0.43, 0.29, 0.42, 0.53, 0.68, 0.10, 0.76, 0.98 (7)

(ii) Develop random number generator for the generation of numbers that has the distribution:

F(t)=(t-1/2)/6 when 0 = t = 9 and 0 elsewhere. Also generate 5 random numbers. (7)

23. a) Explain the inverse transform technique for generating

(i) Exponential and (7)

(ii) Triangular random variates (7)

(OR)

b) (i) Give the procedure for the generation of Poisson random variates. (7)

(ii) State the various assumptions made in data collection in input modeling. (7)

24. a) (i) What is the difference between validation and verification of simulation model? (6)

(ii) Explain in detail the methods employed for validation and verification of simulation model. (8)

(OR)

b) (i) Develop a random variate generator for a triangular distribution with range (1,10) and mode at x=4. (6)

(ii) Describe a random variable generator for discrete distribution with pmf given by

$P(x) = [2x/k(k+1)]$, $x = 1,2,\ldots\ldots k$. (8)

25. a) Briefly describe the output analyzer of Arena .

(OR)

b) Using a Simulation Language or otherwise make a flow chart for the following simulation:

A parent volunteers to remind other parents to come to school meeting next week. It takes 5 2 second to find the next number to call, 7 2 second to place the call and 30 5 seconds to give the message for each parent on the list. The chance of reaching a parent is 35%.

(i) How many were reached out of 100 parents?

(ii) How long does it take?

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