Total number of printed pages – 4 **B. Tech**

CPME 6404

Eighth Semester Examination – 2008

SIMULATION, MODELLING AND CONTROL

Full Marks – 70

Time : 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Write short notes on the following : 2 × 10

   (a) Block Diagram

   (b) Transfer Function

   (c) Nyquist plot

   (d) Closed Loop Control

   (e) Random Numbers

   (f) Random Varieties

   (g) Continuous Simulation

   (h) Terminating Simulation

   (i) Entities, Activities, Events and state variables.

   (j) Simulation clock.

2. Consider the following continuously operating job shop. International times of jobs are distributed as follows :

Jobs	0	1	2	3
Probability of arrival	0.23	0.37	0.28	0.12

Processing times for jobs are normally distributed with mean 50 minutes and standard deviation 8 minutes. Construct a simulation table and perform a simulation for 10 new customers. What is the average processing time of the 10 new jobs ? 10

3. Consider a bank with four tellers. Tellers 3 and 4 deal only with business accounts while Teller 1 and 2 deal with general accounts. Clients arrive at the bank at the rate of one every 3 ± 1 minutes. Of the clients, 33% are business accounts. Clients randomly choose between the two tellers available for each type of account. Business accounts take 15 ± 10 minutes to complete and general account takes 6 ± 5 minutes to complete. Simulate system for 20 transactions to be completed. What percentage of time is each type of teller busy ? 10

4. (a) Use the mixed congruential method to generate a sequence of ten two – digit random numbers with $X_o = 37$, $a = 7$, $c = 29$, and $m = 100$. 5

   (b) How do you test uniformity of random numbers ? 5

5. (a) Lead times have been found to be exponentially distributed with mean 3.7 days. Generate five random lead times from this distribution. 5

   (b) Regular maintenance of a production routine has been found to vary and has been modeled as a normally distributed random variable with mean 33 minutes and variance 4 minutes. Generate five random maintenance times with the give in distribution. 5

6. Discuss the methods for analyzing output of steady state simulation. 10

7. State Routh's Criterion for stability. Explain how stability of a feedback control system constituted of a Polynomial can be determined without finding roots by the above criterion. 10

8. Why is that the frequency domain system of analysis and design popular compared to time domain system ? 10

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