Total number of printed pages – 7

MCA

PMC 5905

Fifth Semester Examination – 2007

QUANTITATIVE TECHNIQUES – II

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. Answer the following questions : 2×10

   (i) What do you mean by the activity of a system ? Give an example.

   (ii) Give examples of two entities of a factory system and one attribute of each entity.

P.T.O.

(iii) Distinguish between endogenous and exogenous activities of a system and give examples in each case.

(iv) How do you distinguish between static and dynamic system models ?

(v) Generate four random numbers using multiplicative congruence method with $X_0 = 5$, $a = 17$ and $m = 64$, where $X_{i+1} = aX_i \pmod{m}$.

(vi) What are the methods generally used for validation of models ?

(vii) Distinguish between the entities facility and storage in GPSS.

(viii) What are the different control statements in GPSS ?

(xi) Do you think a static model can be made dynamic ? If so, give an example.

(x) What are the different queuing models ?

2. (a) Describe the different principles used in modeling a system with an example in each case. 5

(b) A new bus route is to be added to a city and the traffic manager is to determine how many extra buses will be needed. What are the key attributes of the passengers and buses that he should consider ? If the company manager wants to asses the effect of the new route on the transit system as a whole, how would you suggest he aggregate the features of the new line to form part of a total system model ? Would you suggest a continuous or discrete model for the traffic manager and the company manager ? 5

3. (a) Describe Cobweb model. Draw a Cobweb model for the following market.

$D = 12.4 - 1.2\,P$

$S = 8.0 - 0.6\,P_{-1}$

$P_0 = 1.0$

Where, D, P and S denote demand, price and supply respectively. 5

(b) Find the correct value of the constant A that makes the following equation in y, a probability density function. Derive formula for generating random numbers having this distribution and compute first five values.

$y = 0.5 + A(x + 1.5)$ if $1 \leq x \leq 2$

$= 0$ otherwise 5

4. (a) Describe different methods for generating random numbers. 5

(b) What are the significance of random numbers in system simulation ? What do you mean by uniformly distributed random

numbers ? How can you check the uniformity and independence of random numbers generated by any method ? 5

5. (a) Customers arrive at a service facility to get the required service. The interarrival and service time are 1.8 minutes and 4 minutes respectively. Simulate the system for 14 minutes. Determine the average awaiting time of a customer and idle time of the service facility. 5

(b) The following table gives the arrival pattern at a coffee counter for "one minute" intervals. The service is taken as 2 persons in one minute in one counter.

No. of persons arriving	0	1	2	3	4	5	6	7
Probability	0.05	0.1	0.15	0.30	0.20	0.10	0.05	0.05

Using simulation technique and the following 20 random numbers, generate the pattern of arrivals and the queue formed.

5, 25, 16, 80, 35, 48, 67, 79, 90, 92, 9, 14, 1, 55, 20, 71, 30, 42, 60, 85. 5

6. (a) Explain Monte Carlo method with an example. Give the situations where these methods are useful. 5

(b) A bakery keeps stock of a popular brand of the cake. Daily demand based on the past experience is given below :

Daily demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Considering the following sequences of random numbers 48, 78, 09, 51, 56, 77, 15, 14, 68, 09 simulate the demand for the next 10 days. 5

7. (a) What are the forms of the following blocks used in GPSS ? What are the uses of these blocks in simulation process ? Also state the different fields they use.

ADVANCE, GENERATE, ASSIGN 5

(b) Write a GPSS program for the following problem :

People arrive at the rate of one every 10 ± 5 minutes to use a single telephone. If the telephone is busy, 50% of the people come back to try again 5 minutes later. The rest give up. Assuming that a call takes 6 ± 3 minutes, count how many people will have given up by the time 1000 calls have been completed ? 5