5th Semester Regular/Back Examination – 2016-17
QUANTITATIVE TECHNIQUE- II (Modelling and Simulation)
Branch : MCA
Time: 3 Hours
Max marks: 70
Q Code:Y330

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1   Answer the following questions: (2 x 10)

(a) What do you mean by simulation ? Explain by suitable example.
(b) Explain the markovian property of a stochastic process with a suitable example.
(c) What is mid square method ? How it's useful for generating pseudo random number.
(d) Explain how acceptance rejection method has advantages over inverse transform method in simulating a random variable.
(e) Explain counter variables and system state variables in a discrete event simulation.
(f) What is "Absorbing State". Explain with example.
(g) What is random number ? What are the various techniques for generation of random number ?
(h) Explain inverse transform method in simulating a random variable.
(i) "Variance reduction is an essential part of simulation". Justify the statement with an example.

(j) What are the important parameters in a queuing system ?

Q2 (a) Write the algorithm to generate random variable having density function   (5)
$$f(x)= \tfrac{1}{2}(x^2 - 2x^3 + x^4), 0 \le x \le 1$$

(b) Evaluate the integral $\int_0^\infty X(1+X^2)^{-2}$ dx by simulation technique using the following radom numbers. 15, 14, 30, 45, 67, 89, 33, 87, 55, 25.   (5)

Q3 (a) Consider a bag full of Rs.500 and Rs. 1000 notes with old and new currency. If the notes are picked randomly there are having two states, state 1 (Getting a new note), state 0 (Getting an old note) & it is having the following one step transition probabilities

$$P\{X_{t+1}=0 \mid X_t=0\}=0.3$$
$$P\{X_{t+1}=0 \mid X_t=1\}=0.6$$

Define the n step transition matrix when n=2 and Draw the transition diagram. (5)

(b) Write down the characteristics of markov decision process. (5)

Q4 Explain the various state of a markov chain and identify the various states in the following one step transition probability. (10)

State	0	1	2	3	4
0	1/4	2/4	1/4	0	0
1	1/2	1/2	0	0	0
2	0	0	1	0	0
3	0	0	0	2/3	1/3
4	1	0	0	0	0

Q5 (a) Explain various process of simulation of a queuing system. (5)

(b) What do you mean by importance sampling ? Explain how it is useful in case of a population research. (5)

Q6 (a) State the rejection method for generation of random number. (5)
(b) How Chi-square test is useful for statistical validation of data, explain briefly. (5)

Q7 (a) Explain how antithetic variables are used in variance reduction. (5)
(b) If S is a standard normal random variable, design a study using antithetic variable to estimate $\theta = E[\, S^3 e^s \,]$ (5)

Q8 Write short notes on the following (5 x 2)
(a) Stratified Sampling
(b) Variance reduction techniques