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Total Number of Pages : 02

MCA
MCC504

5th Semester Back Examination 2019-20
QUANTITATIVE TECHNIQUES-II (MODELLING AND SIMULATION)

BRANCH : MCA

Time : 3 Hours

Max Marks : 70

Q.CODE : HB248

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) State Chapman-Kolmogorov equations. What is the use of these equations?
- b) Differentiate transient state and recurrent state.
- c) When a Markov chain is said to be ergodic?
- d) State the properties of continuous time Markov chain.
- e) Differentiate between Stratified sampling and Cluster sampling.
- f) Write the procedure to generate T_s , the time of the first arrival after time t in a queueing system.
- g) Explain how acceptance rejection method has advantage over inverse transform method in simulating a random variable.
- h) Write the use of antithetic variables in Simulation.
- i) Differentiate between time variable, counter variable and System state variable.
- j) State different methods to reduce the variance.

Q2 a) Explain Markov chain with suitable examples. (5)
 b) Explain policy improvement algorithm to find optimal policy for a Markov decision process. (5)

Q3 The school of International Studies for Population found out by its survey that the mobility of the population of a state to the village, town and city is in the following percentages : (10)

From	To		
	Village	Town	City
Village	50%	30%	20%
Town	10%	70%	20%
City	10%	40%	50%

What will be the proportion of population in village, town and city after two years, given that the present population has proportions of 0.7, 0.2 and 0.1 in the village, town and city respectively? What will be the respective proportions in the long run?

Q4 Explain Polar method to generate Normal random variables with example. (10)

Q5 a) Explain inverse transform algorithm to generate binomial random variable. (5)
 b) Explain rejection method. Use the rejection method to generate a random variable having density function (5)

$$f(x) = 20x(1-x)^3, 0 < x < 1$$

- Q6** Explain goodness of fit test. The following table shows the distribution of digits in numbers chosen at random from a telephone directory. **(10)**

Digits :	0	1	2	3	4	5	6	7	8	9
Frequency :	1026	1107	997	966	1075	933	1107	972	964	853

Test whether the digits may be taken to occur equally frequently in the directory.

- Q7** Consider the following sequence of five numbers: 0.44, 0.81, 0.14, 0.05, 0.93 are generated. Use the Kolmogorov-Smirnov test with $\alpha = 0.05$ to test the uniformity property of random number generated. **(10)**

- Q8** Write short notes on : (Any TWO) **(5 x 2)**
- a) Discrete event simulation.
 - b) Variance reduction by conditioning.
 - c) Markov decision process