

System Modeling and Simulation

QP Code : 19437

(3 hours)

[Total 80 marks]

- N.B: (1) Question No. 1 is compulsory.
 (2) Attempt any four out of remaining six questions.
 (3) Assume any necessary data but justify the same.
 (4) Figures to the right indicate marks.
 (5) Use of scientific calculator is allowed.

22/05/15

Q.1.

(a) Explain in detail Simulation application in any one of the following system:-

- (i) Vehicles flow analysis at a petrol pump.
 (ii) Passenger flow analysis at railway reservation counter.
 (iii) Customer flow analysis in supermarket.

[10]

(b) Use the Multiplicative Congruential method to generate sequence of five two digit random numbers using $X_0=63$, $a=19$, $m=100$. [5]

(c) A medical examination is given in 3 stages by physician. Each stage is exponentially distributed with a mean service time of 20 minutes. Find the probability that the exam will take 50 minutes or less. Also compute expected length of the exam. [5]

Q.2.

(a) Explain the inverse transform method to generate random variate for exponential distribution. Use it to generate 2 random variate for exponential distribution with parameter $\lambda=2$. Use random numbers 0.30, 0.48 [8]

(b) Draw the flowchart and explain the steps in simulation study. [7]

Q.3.

(a) A paper seller buys the paper for 35 paise each and sells them for 50 paise each. Newspapers that are not sold at the end of the day are sold as scrap for 5 paise each. Newspapers can be purchased in bundles of 10. Thus the newspaper seller can buy 50, 60 & so on. There are 3 types of newspapers: "good", "fair", "poor" with the probability of 0.37, 0.43 and 0.20 respectively. The distribution of papers demanded on each day is as follows. Simulate the above for 5 days and find total the profit from sales, if he purchases 80 papers each day. [8]

Distribution of Newspaper Demanded

Demand	Demand probability distribution		
	Good	Fair	Poor
40	0.03	0.10	0.44
50	0.05	0.18	0.22
60	0.15	0.40	0.16
70	0.20	0.20	0.12
80	0.35	0.08	0.06
90	0.15	0.04	0.00
100	0.07	0.00	0.00

Use the following random numbers.

For Type of Newspaper: 94, 77, 49, 45, 43

For demand : 80, 20, 15, 88, 98

(b) Write a note on verification and validation process. [7]

[TURN OVER

DP-Con. : 10281-15.

Q.4.

(a) Explain the advantages and disadvantages of simulation. [8]

(b) Describe the Poisson process. A mainframe computer crashes in accordance with a Poisson process with a mean rate of one crash every 36 hours. Determine the probability that the next crash will occur between 24 and 48 hours after the last crash. [7]

Q.5.

(a) Given the following data for utilization for the Able-Baker car hop problem. Calculate the overall point estimators, standard error and 95% confidence intervals for the same. [8]

(Given $t_{0.025,3}=3.18$).

Run :	1	2	3	4
Able's utilization:	0.808	0.875	0.708	0.842

(b) Explain how output analysis is performed for terminating simulations. [7]

Q.6.

(a) Explain in detail "Time Series input models." [8]

(b) Use acceptance rejection techniques to generate three Poisson variates with mean $\alpha=0.2$. [7]

Use following random numbers:

0.4357, 0.4146, 0.8353, 0.9952, 0.8004

Q.7.

(a) Write short note on:-

(i) Goodness of fit test for input analysis. [4]

(ii) Performance parameters of a queuing system. [4]

(b) A set of 100 numbers are to be tested for Uniformity. The observed frequencies in 10 intervals are given below. Use chi-square test to test the hypothesis whether the numbers are uniformly distributed. (Given table value of $\chi_{0.05,9}^2 = 16.9$) [7]

Interval	1	2	3	4	5	6	7	8	9	10
Observed frequency	8	8	10	9	12	8	10	14	10	11