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THIRD SEMESTER
SUPPLEMENTARY EXAMINATION

Roll no.....
B.TECH (CO)
February 2019

CO207 SIMULATION AND MODELLING
(ENGINEERING ANALYSIS AND DESIGN)

Time 3:00 hours

Max. Marks: 50

Note: Attempt any five questions. All Questions Carry Equal Marks.
Assume suitable missing data ,if any:

Q1. Records pertaining to the monthly number of jobs related injuries at an underground coalmine were being studied by a federal agency. The values of past 100 months were as follows:

Injuries per month	0	1	2	3	4	5	6
Frequency of Occurrence	35	40	13	6	4	1	1

Apply the chi-square test to these data to test the hypothesis that the underlying distribution is Poisson. Calculate the parameter mean and use in the equation. Use $\chi^2_{0.05,5} = 11.1$ (10)

- Q.2 a) Explain the flow diagram for the execution of arrival and departure events. (5)
 b) Calculate the mean and variance of exponential distribution. (5)

Q.3 How to simulate a single-server queueing system by showing how its simulation model would be represented inside the computer at time $e_0 = 0$ and the times e_1, e_2, \dots, e_9 at which the 8 successive events occur that are needed to observe the desired number, $n = 4$, of delays in queue. Assume the interarrival and service times of customers are
 $A_1 = 0.4, A_2 = 1.2, A_3 = 0.5, A_4 = 1.7, A_5 = 0.2, A_6 = 1.6, A_7 = 0.2, \dots$
 $S_1 = 2.0, S_2 = 0.7, S_3 = 0.2, S_4 = 1.1, S_5 = 3.7, S_6 = 0.6, \dots$ (10)

Q.4 a) Customers at a restaurant arrive in groups (one to eight persons). The number of persons (per group) and the relative frequencies appear as below. Draw the empirical CDF and PDF. (5)

Arrivals per party	1	2	3	4	5	6	7	8
Frequency	40	100	40	76	15	10	8	11

b) Dr X is a dentist who schedules all his patients for 30 minutes appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and time actually needed to complete the work.

Category of service	Filling	Crown	Cleaning	Extraction	Checkup
Time Required (in mins)	40	60	15	45	15
Probability of category	0.40	0.15	0.15	0.10	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients. Assume that all the patients shown up at the clinic at exactly their scheduled arrival time starting at 8:00 A.M. Use the following random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17, 79. (5)

Q.5 a) Discuss the Queue Behaviour in a Queuing system. (3)

b) 60% of the assembled ink-jet printers are rejected at the inspection station. Find the probability that the first acceptable inkjet printer is the third one inspected. Also find the probability that the third printer inspected is the second acceptable printer? (3)

c) Given the mean and variance for a binomial distribution are 5 and $5/4$ respectively. Find $P(X \geq 1)$. (4)

Q.6 a) Suggest a step by step procedure to generate random variates using inverse transform technique for triangular distribution. (5)

b) Explain the various components used in Discrete Event Simulation Models. (5)