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4E2018

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CSE BY Sem 2011

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B. Tech. (Sem. IV) (Reback) Examination, June/July - 2011
Computer Engg.
4CP5 Statistics & Probability Theory

Time : 3 Hours]

[Total Marks : 80

[Min. Passing Marks : 24

Attempt any **five** questions selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205)

1. _____ Nil

2. _____ Nil

UNIT I

- 1 (a) A and B throw alternatively with a pair of ordinary dice. A wins if he throws 6 before B throws 7 and B wins if he throws 7 before A throws 6. If A begins, show that his chance of winning is $30/61$.

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- (b) A manufacturing firm produces steel pipes in three plants with daily production volumes of 500, 1000 and 2000 units respectively. According to past experience it is known that the fractions of defective output produced by the three plants are respectively 0.005, 0.008 and 0.010. If a pipe is selected from a day's total production and found to be defective, find out

- (i) from which plant the pipe comes ?
(ii) what is the probability that it came from the first plant ?

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- 2 (a) Show that the Poisson distribution is the limiting case of Binomial distribution. Also determine the mean, variance and MGF of Poisson distribution.

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- (b) The water consumption of a city, in excess of 20,000 gallons is exponentially distributed with mean 20,000. The city's water works has a daily stock of 40,000 gallons. What is the probability that the stock is insufficient for atleast two of the three days selected at random ?

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UNIT II

- 3 (a) Given the joint probability density

$$f(x, y) = \begin{cases} \frac{2}{3}(x+2y), & 0 < x < 1, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

Find :

- (i) Marginal density of x and y.
(ii) Conditional density of x given Y = y and use it to

evaluate $P = \begin{cases} x \leq \frac{1}{2} \\ y = \frac{1}{2} \end{cases}$

4+4=8

- (b) From a lot of 25 items contain 5 defectives, a sample of 4 items is drawn at random
(i) without replacement
(ii) with replacement.

Find the expected number of defectives in the sample.

4+4=8

- 4 (a) Calculate the first four moments about the mean of the following distribution. Also calculate β_1 and β_2 :

x: 1 2 3 4 5 6 7 8 9

y: 1 6 13 25 30 22 9 5 2

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- (b) Compute the MTTF of a component of which the time T to failure follows a Weibull distribution with pdf having α, β parameters given by

$$f(t) = \alpha\beta t^{\beta-1} e^{-\alpha t^\beta}, t > 0$$

Also find the failure rate function.

4+4=8



UNIT III

- 5 (a) The time spent by a repairman on his jobs has an exponential distribution with mean 30 minutes. If the repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hours day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ? 8
- (b) Assume that the buses with goods are coming in a market yard at the rate of 30 buses per day and suppose that the inter arrival times follow an exponential distribution. The time to unload the buses is assumed to be exponential with an average of 42 minutes. If the market yard can admit 10 buses at a time, calculate P (the yard is empty) and find the average length of the queue. If the unloading time increases to 48 minutes, then again calculate the above two characteristics. 8
- 6 (a) In a scooter wash service facility, scooters arrive for service according to Poisson distribution with mean 5 per hour. The washing and cleaning time of scooters varies exponentially with mean time of 10 minutes per scooter. The facility cannot handle more than one scooter at a time and has a total of 5 parking spaces. Find :
(i) The effective arrival rate
(ii) The probability that arriving scooter gets service immediately on arrival
(iii) The expected number of parking spaces occupied. 8
- (b) A supermarket has two girls ringing up sales at the counters. If the service time for each customer is exponential with mean 4 minutes and if people arrive in a Poisson fashion at the counter at the rate of 10 per hour then calculate :
(i) The probability of having to wait for service
(ii) The expected percentage of idle time for each girl
(iii) If a customer has to wait, find the expected length of his waiting time. 8

UNIT IV

- 7 (a) Write a short note on discrete parameter Markov chain. 8
- (b) Two brands R and Q of a product have probabilities 30% and 70% respectively at time $t=0$, if their transition matrix P be $\begin{bmatrix} 0.7 & 0.3 \\ 0.2 & 0.8 \end{bmatrix}$, find their probabilities



- (i) after time $t=1$,
- (ii) after time $t=2$ and
- (iii) their steady state probabilities.

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- 8 (a) Automata car wash facility operates with only one bay. Cars arrive according to Poisson distribution, with a mean of 4 cars per hour and may wait in the facilities parking lot if the bay is busy. Find the time spent by a car in the system and in waiting if :
- (i) the time for washing and cleaning a car is exponential with a mean of 10 minutes
 - (ii) the time for washing and cleaning a car is constant and equal to 10 minutes. Also find which facility is better.
- (b) Write a short note on discrete parameter birth-death process.

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UNIT V

- 9 (a) Write a short note on open queuing networks.
- (b) Calculate the correlation coefficient for the following data :
- x : 65 66 67 67 68 69 70 72
- y : 67 68 65 68 72 72 69 71
- 10 (a) In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible :
Variance of x is 9. Regression equations are
 $8x - 10y + 66 = 0$ and $40x - 18y - 214 = 0$. Find :
- (i) the mean values of x and y
 - (ii) variance of y
 - (iii) the coefficient of correlation between x and y .
- (b) Fit a straight line to the following data treating y as the dependent variable :
- x : 1 2 3 4 5
- y : 5 7 9 10 11

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