

4E 2918

Roll No. _____

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4E 2918**B.Tech. IV Semester (Main/Back) Examination 2012****Computer Engg. & I.T.****4IT4 Statistics & Probability Theory****Common for CP & IT****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

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 may 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).

Probability Tables.

Unit - I

1. a) A consignment of 15 record players contains & defectives. The record players are selected at random, one by one, and examined. Those examined are not put back. What is the probability that the 9th one examined is the last defective? (8)
- b) A company selected engineers through campus interview from a university. Out of the total selection made 60%, 30% and 10% are from Electronics, Computer and Mechanical respectively. If 9%, 20% and 60% of the selected students do not join the company. What is the probability that who do not join is from computer stream. (8)

OR

2. a) Compute the mean time to failure of a component of which the time T to failure follows a Weibull distribution with p.d.f. with α, β parameters given by

$$f(t) = \alpha \beta t^{\beta-1} e^{-\alpha t^\beta} ; t > 0 \quad (8)$$

- b) Let the random variable x assume the value 'r' with the probability law.

$$P(x=r) = q^{r-1}P; r = 1, 2, 3, \dots$$

Find the m.g.f. of x and hence it's mean and variance. (8)

Unit - II

3. a) Define the Binomial distribution and prove the following recurrence formula:

$$\mu_{r+1} = pq \left(nr\mu_{r-1} + \frac{d\mu_r}{dp} \right).$$

where μ_r is the r^{th} order central moment. Hence also obtain μ_2 , μ_3 and μ_4 . (8)

- b) If skulls are classified as A, B, C according as the length, breadth index is under 75, between 75 and 80, over 80, find approximately (assuming that the distribution is normal) the mean and standard deviation of a series in which A are 58%, B are 38% and C are 4% being given that if

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-t^2/2} dt$$

then $f(0.20) = 0.80$ and $f(1.75) = 0.46$. (8)

OR

4. a) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as Poisson variate with mean 1.5. Calculate the proportion of days on which
- neither car is used
 - some demand is refused. (8)
- b) Subway trains on a certain line run every half hour between mid night and six in the morning. What is the probability that a man entering the station at a random time during this period will have to wait at least twenty minutes? (8)

Unit - III

5. a) Calculate the correlation coefficient for the following height (in inches) of fathers (X) and their son(Y):

X:	65	66	67	67	68	69	70	72	
Y:	67	68	65	68	72	72	69	71	(8)

- b) Find the most likely price in Bombay corresponding to the price of Rs.70 at Calcutta from the following :

	Calcutta	Bombay
Average price	65	67
Standard deviation	2.5	3.5

Correlation coefficient between the prices of commodities in the two cities is 0.8. (8)

OR

6. a) Explain the method of least squares. Fit a second degree parabola to the following data:

x:	1.0	1.5	2.0	2.5	3.0	3.5	4.0	
y:	1.1	1.3	1.6	2.0	2.7	3.4	4.1	(8)

- b) The ranks of same 16 students in Mathematics and Physics are as follows. Two numbers within brackets denote the ranks of the students in Mathematics and Physics. (1,1) (2,10) (3,3) (4,4) (5,5) (6,7) (7,2) (8,6) (9,8) (10,11) (11,15) (12,9) (13,14) (14,12) (15,16) (16,13).

Calculate the rank correlation coefficient for proficiencies of this group in Mathematics and Physics. (8)

Unit - IV

7. a) Write a short note on M/M/1 models and their applications. (8)
- b) Trains arrive at the yard every 15 minutes and the service time is 33 minutes. If the line capacity of the yard is limited to 5 trains find the probability that the yard is empty and the average number of trains in the system. (8)

OR

8. a) Customers arrive at a sales counter manned by a single person according to a Poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer. (8)
- b) Patients arrive at a clinic according to Poisson distribution at a rate of 30 patients per hour. The waiting room can not accommodate more than 14 patients. Examination time per patient is exponential with mean rate of 20 per hour.
- Find the effective arrival rate at the clinic.
 - What is the prob. that an arriving patient will not wait?
 - What is the expected waiting time until a patient is discharged from the clinic?

Unit - V

9. a) On January 1 (this year) Bakery A had 40% of its local market share while the other two bakeries B and C had 40% and 20% respectively of the market share. Based upon a study by a marketing research firm, the following facts were compiled. Bakery A retains 90% of its customers while gaining 5% of B's customers and 10% of C's customers. Bakery B retains 85% of its customers, while gaining 5% of A's customers and 7% of C's customers. Bakery C retains 83% of its customers and gains 5% of A's customers and 10% of B's. What will each firm's share be on January 1, next year, and what will each firm's market share be at equilibrium. (8)
- b) In a heavy machine shop the overhead crane is 75% utilized. Time study observations gave the average slinging time as 10.5 minutes with a standard deviation of 8.8 minutes. What is the average calling time for the service of the crane and what is the average delay in getting service? If the average service time is cut to 8 minutes, with standard deviation of 6.0 minutes, how much reduction will occur on an average in the delay of getting served. (8)

OR

10. a) Write a short note on Discrete Parameter Birth Death process. (8)
- b) 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
- The time for washing and cleaning a car is exponential with a mean of 10 minutes.
 - The time for washing and cleaning a car is constant and equal to 10 minutes. Also find which facility is better. (8)