

4E2918

Roll No. : _____

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B. Tech. (Sem. IV) (Main/Back) Examination, June/July - 2011
Computer Engg. & I.T.
4IT4 Statistics & Probability Theory (Common with CS & IT)

Time : **3 Hours**][Maxi. 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) From a vessel containing 3 white and 5 black balls, 4 balls are transferred into an empty vessel. From this vessel a ball is drawn and is found to be white. What is the probability that out of four balls transferred 3 are white and 1 black ?

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(b) From a lot of 25 items, containing 5 defective, a sample of 4 items was drawn at random (i) without replacement (ii) with replacement.

Find the expected value of the number of defective items in the drawn sample. **6**

(c) The first four moments of a distribution about the value of the variables are -1.5 , 17 , -30 and 108 . Find the moments about the mean, β_1, β_2 are comment on their values. **5**

OR**4E2918]****1****[Contd...**

- (b) Ten competitors in a beauty contest got marks by three judges in the following orders :

First Judge : 1 6 5 10 3 2 4 9 7 8

Second judge : 3 5 8 4 7 10 2 1 6 9

Third judge : 6 4 9 8 1 2 3 10 5 7

Use the rank correlation coefficient to discuss which pair of judges have the nearest approach to common tastes in beauty.

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OR

- 3 (a) In a partially destroyed laboratory record of an analysis of correlation data, the following results are legible;

variance of $x = 9$

regression equations : $8x - 10y + 66 = 0$, $40x - 18y = 214$ Find :

- (i) The mean values of x and y
(ii) the standard deviation of y and
(iii) coefficient of correlation between x and y

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- (b) Prove that the correlation coefficient lies between -1 and $+1$.

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- (c) Show that θ , the acute angle between the two lines of regression is given by

$$\tan \theta = \left(\frac{1-r^2}{r} \right) \left(\frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2} \right)$$

Interpret the case when $r = 0, \pm 1$.

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UNIT-IV

- 4 (a) In a railway marshalling yard, good train arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes. Calculate the following :
- (i) The mean queue size
 - (ii) The probability that the queue size exceeds 10.
- If the input of trains increase to an average 33 per day, what will be the change in (i) and (ii) ?

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- (b) Write a short note on pure birth process.

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OR

- 4 (a) A barber shop which can accommodate 2 people at a time (1 waiting and 1 getting hair cut). Customers arrive according to Poisson distribution with mean arrival rate 3/hour. The barber cut hair at an average rate of 4/hour. Find P_n ($n \geq 0$), average number of customers in the shop and average waiting time in the system and in the queue.

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- (b) A super market has two girls running 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 rate of 10 per hour, then calculate :

- (i) What is the probability of having to wait for service ?
- (ii) What is the expected percentage of idle time for each girl ?
- (iii) If a customer has to wait, what is the expected length of his waiting time ?

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