

4E4162

Roll No. \_\_\_\_\_

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**4E4162**

**B. Tech. IV-Sem. (Main & Back) Exam; April-May 2017**  
**Computer Sci. & Engg.**  
**4CS3A Statistics & Probability Theory**  
**CS, 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 suitably be assumed and stated clearly.*

*Units of quantities used / calculated must be stated clearly.*

*Use of following supporting materials is permitted during examination.  
(Mentioned in form No. 205)*

1. Normal distribution - Table                      2. NIL

**UNIT - I**

- 1 (a) The probability that a teacher will give an unannounced test during any class meeting is  $1/5$ . If a student is absent twice, what is the probability that he will miss at least one test ?

8

- (b) The first four moments of a distribution about the value 5 of the variate are 2, 20, 40 and 50. Also find mean and variance of the distribution.

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**OR**

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1

[ P.T.O.

- 1 (a) Two random variables X and Y have the following joint probability density function :

$$f(x, y) = \begin{cases} 2 - x - y, & 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0 & , \text{ otherwise} \end{cases}$$

Find

- (i) Marginal probability density functions of  $x$  and  $y$
- (ii) Conditional density functions
- (iii) Var (X) and Var (Y)

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- (b) If the life time of a component has probability density function  $\lambda e^{-\lambda t}$ ,  $t > 0$ .  
Compute its time to failure and variance.

Also define the mean time to failure in terms of the reliability function.

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## UNIT - II

- 2 (a) Determine the mean and variance of binomial distribution. Also define moment generating function of binomial distribution.

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- (b) A driver has two taxies, which he hires out day by day. The number of demands for a taxi on each day is distributed as a Poisson variate with mean 1.5. Calculate the proportion of days on which
- (i) neither of the cars is used
  - (ii) some demand is refused (Given  $e^{-1.5} = 0.2231$ ).

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**OR**

- 2 (a) As a result of tests on 20,000 electric bulbs manufactured by a company it was found that the life time of the bulb was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. On the basis of the information estimate the number of the bulbs that is expected to burn for (i) more than 2150 hours (ii) less than 1960 hours.

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- (b) Define exponential distribution . Show that for the exponential distribution given by  $dp = ae^{-\frac{x}{c}}$ ,  $0 \leq x < \infty$ ,  $c > 0$  a being a constant, the mean and the standard deviation are each equal to C.

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**UNIT - III**

- 3 (a) Calculate the coefficient of correlation between  $x$  and  $y$  using the following data :

$x$ : 1 2 3 4 5 6 7 8 9

$y$ : 9 8 10 12 11 13 14 16 15

8

- (b) Calculate rank correlation coefficient for the following data :

$x$ : 81 78 73 73 69 68 62 58

$y$ : 10 12 18 18 18 22 20 24

8

**OR**

- 3 (a) Write a short note on linear regression and obtain the regression line of  $y$  on  $x$ .

4+4=8

- (b) Fit a second degree parabola to the following data :

$x$ : 0 1 2 3 4

$y$ : 1 5 10 22 38

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**UNIT - IV**

- 4 (a) On a telephone booth, arrivals of customers follow the Poisson process with an average time of 10 minutes between one arrival and next arrival. The length of a phone call is assumed to be distributed exponentially with mean 3 minutes.
- (i) Find the average number of persons waiting in the system.
  - (ii) What is probability that a customer spends more than 10 minutes in the booth ?
  - (iii) Find the fraction of a day when the phone will be used.

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- (b) Assume that the trucks with goods are coming in a market yard at the rate of 30 trucks per day and suppose that the inter-arrival times follow an exponential distribution. The time to unload the trucks is assumed to be exponential with an average of 42 minutes. If the market yard can admit 10 trucks at a time, calculate P (the yard is empty) and find the average length of queue.

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**OR**

- 4 (a) Patients arrive at a clinic according to Poisson distribution at a rate of 30 patients per hour. The waiting room cannot accommodate more than 14 patients. Examination time per patient is exponential with mean rate of 20 per hour.
- (i) Find the effective arrival rate at the clinic.
  - (ii) What is the probability that an arrival patient will not wait ?
  - (iii) What is the expected waiting time until a patient is discharged from the clinic ?

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- (b) A super market has two girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find :
- (i) the probability that an arriving customer has to wait for service.
  - (ii) the average number of customers in the system.
  - (iii) the average time spent by a customer in the super market.

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### UNIT - V

- 5 (a) Write a short note on discrete parameter Markov chain.

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- (b) Two brands A and B 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  $t = 2$
- (iii) their steady state probabilities.

8

**OR**

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[ P.T.O.

- 5 (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 the waiting if

(i) the time for washing and cleaning a car is exponential with a mean of 10 minutes

(ii) the time of washing and cleaning a car is constant and is equal to 10 minutes. Which facility is better ?

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- (b) Write a short note on M/G/1 queuing model.

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