4E4162	Roll No.	Total No of Pages: 4

4E4162
B. Tech. IV Sem. (Main/Back) Exam., June/July-2014
Computer Science and Engineering
4CS3A Statistics and Probability Theory
Common with 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 material is permitted during examination.

(Mentioned in form No.205)

1.________________ 2.________________

UNIT-I

Q.1 (a) Each coefficient in the equation $ax^2 + bx + c = 0$ is determined by throwing an ordinary die. Find the probability that the equation will have real roots. [8]

(b) In a bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total bolts. Of their output 5%, 4% and 2% are respectively defective bolts. A bolt is drawn at random from the product, and is found to be defective, What is the probability that it is manufactured by machine A, B and C? [8]

OR

Q.1 (a) Given the joint probability density [8]

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

Find.

(i) Marginal density of X and Y.

(ii) Conditional density of X given Y = y and use it to evaluate $P\left\{\frac{X \le 1/2}{Y = 1/2}\right\}$

(b) Let f(t) be the pdf of time to failure T of a system and h(t) be the hazard rate function. Find h(t) and MTTF when. $f(t) = \lambda^2 t e^{-\lambda t}$ [8]

UNIT-II

Q.2 (a) Out of 800 families with 4 Children each, How many families would be expected to have [8]

(i) 2 boys and 2 girls

(ii) at least 1 boy

(iii) at most and girls. Assume equal probabilities for boys and girls

(b) Fit a Poisson distribution to the following data which gives the number of dodders in a sample of clover seeds [8]

No. of Dodders (x):	0	1	2	3	4	5	6	7	8
Observed frequency (f):	56	156	132	92	37	22	4	0	1

OR

Q.2 (a) Find the mean and Variance of Poisson Distribution. [8]

(b) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the parameters of distribution. (Given ϕ (0.50) = 0.19 and ϕ (1.41) = 0.42) [8]

UNIT-III

Q.3 (a) Calculate the karl Pearson's Coefficient of correlation of the following data: [8]

X :	25	27	30	35	33	28	36
Y :	19	22	27	28	30	23	28

(b) Show that the angle between the lines of regression is given by: [8]

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

OR

Q.3 (a) Obtain the rank correlation Coefficient for the following data: [8]

x :	68	64	75	50	64	80	75	40	55	64
y :	62	58	68	45	81	60	68	48	50	74

(b) Lines 2x+3y = 10 and 4x+5y = 18 are lines of regression between two variables x and y. Decide which one is the line of regression of x on y. Given x =5, find y and also find mean values of Variables. [8]

UNIT-IV

Q.4 (a) Write short note on Pure Birth death process. [8]

(b) Arrivals at a telephone booth are considered to be Poisson, with an average time of 10 minutes between one arrival and the next. The length of a phone call is assumed to be distributed exponentially, with mean 3 minutes. Find: [8]

(i) What is the probability that a person arriving at the booth will have to wait?

(ii) What is the average length of queue that form from time to time?

(iii) The telephone company will install a second booth when convinced that an arrival would have to wait at least 3 minutes for the phone. By how much must the flow of arrivals be increased in order to justify for a second booth?

OR

Q.4 (a) If for a period of 2 hours in a day (8-10 AM), trains arrive at the yard (Capacity of which is 4 trains) in every 20 minutes, but the service time remains 36 minutes. Then calculate for this period: [8]

(i) The probability that the yard is empty.

(ii) The average queue length.

(b) A Supermarket 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: [8]

(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 supermarket.

UNIT-V

Q.5 (a) Write short notes on the following: [8]

(i) Discrete parameter Markov chain.

(ii) Transition probability Matrix

(b) Corresponding to a Markov chain, the initial provability matrix $P^{(o)} = \left(\frac{1}{4}, \frac{3}{4}\right)$

and transition probability matrix (tpm) is $P = \begin{array}{c} \\ A \\ B \end{array}\begin{bmatrix} A & B \\ 1/3 & 2/3 \\ 1/2 & 1/2 \end{bmatrix}$ where A and B

denote the two states of the process. Find:

(i) The probability of reaching state A after two steps $P_A(2)$.

(ii) The probability of state B after two steps.

(iii) $[t_i]$ matrix when $n \to \infty$ [8]

OR

Q.5 (a) Describe briefly the (M/G/1) : (∞/GD) queuing system analysing the steady State solution. [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]

--------------X--------------