CBCS SCHEME

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BCS301/BAD301/BAI301/BDS301

Third Semester B.E./B.Tech. Degree Examination, June/July 2025
Mathematics for Computer Science

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	The probability density function of a variate X is given by the following table : X: 0 1 2 3 4 5 6 P(X): K 3K 5K 7K 9K 11K 13K (i) For what value of K, does this represent a valid probability distribution? (ii) Find $P(X<4)$ (iii) Find $P(3<X\leq 6)$	06	L2	CO1
	b.	2% fuses manufactured by a firm are found to be defective. Find the probability that the box containing 200 fuses contains. (i) No defective fuses (ii) 3 or more defective fuses. (iii) Atleast one defective fuse.	07	L2	CO2
	c.	The length in time (minutes) that a certain lady speaks on a telephone is a random variable with probability density function. $f(x)=\begin{cases} Ae^{-x/5} & \text{for } x>0 \\ 0 & \text{elsewhere} \end{cases}$ Find the value of the constant A. What is the probability that she will speak over the phone for, (i) More than 10 minutes (ii) Less than 5 minutes (iii) Between 5 and 10 minutes	07	L3	CO2
		OR			
Q.2	a.	Find the constant K such that the function $f(x)=\begin{cases} Kx^2 & \text{for } 0<x<3 \\ 0 & \text{otherwise} \end{cases}$ is a probability density function. Also compute $P(1<x<2), P(x\leq 1)$.	06	L2	CO1
	b.	Obtain the mean and variance of Binomial distribution.	07	L2	CO2
	c.	The marks of 1000 students in an examination follows a normal distribution with mean 70 and standard deviation 5. Find the number of students whose marks will be, (i) Less than 65 (ii) More than 75 (iii) between 65 and 75, Given A(1) = 0.3413, where A(Z) is the area under standard normal curve from 0 to Z.	07	L3	CO2
		Module – 2			
Q.3	a.	Define (i) Probability vector (ii) Regular stochastic matrix (iii) Absorbing state of Markov chain.	06	L1	CO3
	b.	A students study habits are as follows : If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night, he is 60% sure not to study the next night. In the long run how often does he study?	07	L3	CO3

	c.	The joint probability distribution for two random variables X and Y is given below : Y \ X: 1 → 0.1, 0.2, 0, 0.3 ; 2 → 0.2, 0.1, 0.1, 0 (columns -2, -1, 4, 5) Determine : (i) The marginal distribution of X and Y. (ii) E[X], E[Y], E[XY] (iii) COV(X, Y)	07	L2	CO2
		OR			
Q.4	a.	Find the fixed probability vector of the regular stochastic matrix $\underline{P} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ \frac{1}{2} & \frac{1}{2} & 0 \end{bmatrix}$.	06	L2	CO3
	b.	A habitual gambler is a member of two clubs A and B. He visits either of the clubs every day for playing cards. He never visits club A on two consecutive days. But if he visits club B on a particular day then the next day he is as likely to visit club B or club A. If the person had visited club B on Monday, find the probability that he visits club A on Thursday.	07	L3	CO3
	c.	The joint probability distribution of two discrete random variable X and Y is given by, $f(x, y) = K(2x+y)$ where x, y are integers such that $0 \le x \le 2$, $0 \le y \le 2$. Find (i) K (ii) Marginal probability distribution of X and Y (iii) $P(X \ge 1, Y \le 2)$	07	L2	CO2
		Module – 3			
Q.5	a.	Define : (i) Null hypothesis (ii) Significance level (iii) Type I and Type II errors	06	L1	CO4
	b.	A die was thrown 1200 times and the number 6 was obtained 236 times. Can the die be considered fair at 1% level of significance?	07	L3	CO4
	c.	One type of aircraft is found to develop engine trouble in 5 flights out of a total of 100 and another type in 7 flights out of a total of 200 flights. Is there a significance difference in the two types of aircrafts so far as engine defects are concerned?	07	L3	CO4
		OR			
Q.6	a.	Explain (i) Sampling distribution (ii) Statistical hypothesis (iii) Testing of hypothesis	06	L1	CO4
	b.	A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased at 1% level of significance.	07	L3	CO4
	c.	In an exit poll enquiry it was revealed that 600 voters in one locality and 400 voters from another locality favoured 55% and 48% respectively a particular party to come to power. Test the hypothesis that there is a difference in the locality in respect of the opinion at 5% level of significance.	07	L3	CO4

Module – 4

Q.7 **a.** (i) State central limit theorem. (ii) What is 95% and 99% confidence limits for unknown mean μ of a random sample of size n? | **06** | **L1** | **CO5**

b. Certain tubes manufactured by a company have mean life of 800 hours and standard deviation of 60 hours. Using central limit theorem, find the probability that a random sample of 16 tubes taken from the group will have mean life time.
(i) Between 790 hours and 810 hours.
(ii) Less than 785 hours
(iii) More than 820 hours
Given A(0.67) = 0.2486, A(1) = 0.3413, A(1.33) = 0.4082 | **07** | **L2** | **CO4**

c. Two Samples of sizes 9 and 8 give the sum of squares of deviations from their respective means equal to 160 inches^2 and 91 inches^2 respectively. Can these be regarded as drawn from the same normal population? Use 5% points of significance for F. | **07** | **L2** | **CO4**

OR

Q.8 **a.** A random sample of 400 items choosen from an infinite population is found to have a mean of 82 and a standard deviation of 18. Find the 95% confidence limits for the mean of the population from which the sample is drawn. | **06** | **L1** | **CO5**

b. A mechanist is making engine parts with axle diameter of 0.7 inch. A random sample of 10 parts shows mean diameter 0.742 inch with standard deviation of 0.04 inch. On the basis of this sample, would you say that the work is interior, given $t_{0.05} = 2.262$ for degrees of freedom = 9. | **07** | **L2** | **CO4**

c. A set of five similar coins is tossed 320 times and result is,

Number of heads	0	1	2	3	4	5
Frequency	6	27	72	112	71	32

Test the hypothesis that the data follows Binomial distribution,
(Given : $\chi^2_{0.05} = 11.07$ for d.f = 5) | **07** | **L3** | **CO4**

Module – 5

Q.9 **a.** Set up ANOVA table for the following information relating to three drugs testing to judge the effectiveness in reducing blood pressure for three different groups of people.

Group of people	Drug		
	X	Y	Z
A	14	10	11
	15	9	11
B	12	7	10
	11	8	11
C	10	11	8
	11	11	7

Do the drugs act differently?
Are the different groups of people affected differently? Is the interaction term significant?
Answer the above questions taking a significant level of 5%. Given F(2, 9) = 4.26, F(4, 9) = 3.63 | **10** | **L3** | **CO6**

	b.	Present your conclusions after doing analysis of variance to the following results of the Latin square design experiment conducted in respect of fiver fertilizers which were used on plots of different fertility. Given A 16 B 10 C 11 D 9 E 9 E 10 C 9 A 14 B 12 D 11 B 15 D 8 E 8 C 10 A 18 D 12 E 6 B 13 A 13 C 12 C 13 A 11 D 10 E 7 B 14	**10**	**L3**	**CO6**
		OR			
Q.10	**a.**	It is desired to compare three hospitals with regards to the number of deaths per month. A sample of death records were selected from the records of each hospital and the number of deaths was as given below. From these data, use ANOVA and suggest a difference in the number of deaths per month among the three hospitals. Given at 5% level, $F_{2,12} = 3.89$. Hospitals: A B C 3 6 7 4 3 3 3 3 4 5 4 6 0 4 5	**10**	**L3**	**CO6**
	b.	Analyze and interpret the following statistics concerning output of wheat per field obtained as a result of experiment conducted to test four varieties of wheat viz. A, B, C and D under a Latin square design. C 25 B 23 A 20 D 20 A 19 D 19 C 21 B 18 B 19 A 14 D 17 C 20 D 17 C 20 B 21 A 15	**10**	**L3**	**CO6**

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