CBCS SCHEME

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BCS/BAD/BAI/BDS301

Third Semester B.E./B.Tech. Degree Examination, Dec.2025/Jan.2026
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.	A random variable X has the following probability function for various values of X. X : 0 1 2 3 4 5 6 7 P(x) : 0 K 2k 2k 3k k^2 $2k^2$ $7k^2+k$ i) Find the value of k ii) Evaluate $P[x<6]$, $P[0<x<5]$, $P[x\geq 6]$.	6	L2	CO1
	b.	Find the mean and standard deviation of Binomial distribution.	7	L2	CO2
	c.	If the probability of a bad reaction from a certain injection is 0.001. Determine the probability that out of 2000 individuals more than two will get a bad reaction.	7	L3	CO2
		OR			
Q.2	a.	Find K such that $F(x) = \begin{cases} k\,e^{-x} & , \quad 0<x<1 \\ 0 & , \quad \text{otherwise} \end{cases}$ Represents a valid pdf and hence find mean of the distribution.	6	L2	CO1
	b.	In a certain town the duration of a shower is exponentially distributed with mean 5 minutes. What is the probability that a shower will last for i) 10 minutes or more ii) less than 10 minutes.	7	L3	CO2
	c.	The marks of 1000 students in an examination follows a normal distribution with $\mu = 70$ and S.D = 5. Find the number of students whose marks will be i) less than 65 ii) more than 75 iii) between 65 & 75. Given $\phi(1) = 0.3413$.	7	L3	CO2
		Module – 2			
Q.3	a.	The joint probability distribution of two random variables x and y is x \ y: -4 2 7 1: 1/8 1/4 1/8 5: 1/4 1/8 1/8 i) Find the marginal distribution of x and y. ii) Obtain the covariance of x and y.	6	L2	CO2

	b.	Find the unique fixed probability vector of $P = \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{6} & \frac{1}{2} & \frac{1}{3} \\ 0 & \frac{2}{3} & \frac{1}{3} \end{bmatrix}$	7	L2	CO3
	c.	A student study habit are as follows : If he studies one night , he is 70% sure of not studying 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?	7	L3	CO3
		OR			
Q.4	a.	Define the following : i) Probability vector ii) Regular stochastic matrix iii) Absorbing state.	6	L2	CO3
	b.	If X and Y are two independent random variables with the following distribution. Find the joint probability distribution of X and Y and hence find the covariance.	7	L2	CO2
	c.	Three girls A, B, C are throwing the ball to each other. A always throws the ball to B, B always throws the ball to C. C is just as likely to throw the ball to B as to C. If C was the first person to throw the ball, find the probability that after 3 throws A, B, C has the ball.	7	L3	CO3
		Module – 3			
Q.5	a.	Explain the following terms : i) Null Hypothesis ii) Type 1 and 2 error iii) Test of significance	6	L1	CO5
	b.	A die is thrown 9000 times and throw of 3 or 4 was observed 3240 times. Do the data indicate that an unbiased dice at 5% level of significance $Z_{0.05} = 1.96$.	7	L3	CO4
	c.	A random sample for 1000 workers in company has mean wage of Rs 50 per day and S.D of Rs 15. Another sample of 1500 workers from another company has mean wage of Rs 45 per day and S.D of Rs 20. Does the mean rate of wages varies between two companies at 1% level of significance.	7	L3	CO4
		OR			
Q.6	a.	Certain tubes manufactured by a company have mean life time of 800 hours and S.D of 60 hrs. Find the probability that a random sample of 16 tubes taken from the group will have a mean life time of : i) Between 790 hrs and 810 hrs ii) Less than 785 hrs iii) More than 820 hrs Given $\phi(0.67) = 0.2486$; $\phi(1) = 0.3413$; $\phi(1.33) = 0.4082$	6	L3	CO4

x	1	2
f(x)	0.7	0.3

y	-2	5	3
g(y)	0.3	0.5	0.2

	b.	It has been found from experience that the mean breaking strength of a particular brand of thread is 275.6 gms with standard deviation of 39.7 gms. Recently a sample of 36 pieces of thread showed a mean braking strength of 253.2 gms. Can one conclude at a significance level of 5% that the thread has become inferior?	7	L3	CO4
	c.	In an elementary school examination of mean grade of 32 boys was 72 and S.D 8, while the mean grade of 36 girls was 75 and S.D 6. Test the hypothesis that the performance of girls is better than boys at 1 % ℓ.O.S.	7	L3	CO4
		Module – 4			
Q.7	a.	An unknown distribution has mean 635 and S.D 1.36 samples of size 36 are drawn from this population. Find the probability that the sample mean is between 634.76 and 635.24 given $\phi(1.06) = 0.3554$.	6	L2	CO4
	b.	The mean and S.D of the maximum loads supported by 60 cables are 11.09 tonnes and 0.73 tonnes respectively. Find 95% C.I for mean of the maximum loads of all cables produced by the company.	7	L2	CO4
	c.	A certain stimulus administrated to each of the 12 patients resulted in the following change in blood pressure, 5, 2, 8, -1, 3, 0, 6 -2, 1, 5, 0, 4. Can it be concluded that the stimulus will increase the blood pressure given $t_{0.05} = 2.201$ for 11 d.o.f.	7	L3	CO4
		OR			
Q.8	a.	Ten individuals are chosen at random from a population and their heights in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that the mean height of the universe is 66 inches ($t_{0.05} = 2.262$ for 9 d.o.f).	6	L3	CO4
	b.	A sample of 11 rats from 9 population had an average blood viscosity of 3.92 with a S.D of 0.61. On the basis of the sample establish 95% C.I for the mean blood viscosity of the population. ($Z_{0.05} = 1.96$).	7	L2	CO5
	c.	A die is thrown 264 times and the number appearing on the face (x) follows the following frequency distribution : x: 1, 2, 3, 4, 5, 6 y: 40, 30, 26, 56, 52, 60 Calculate the value of χ^2 at 5% of level of significance.	7	L3	CO4

Module – 5

Q.9 **a.** A manufacturing company has purchased three new machines of different makes and wishes to determine whether one of them is faster than the others in producing a certain output. Five hourly production figures are observed at random from each other machine and the results are given below. Use Anova and determine whether the machines are significantly different in their mean speed ($F_{2,12} = 3.89$). **10 L3 CO5**

Observation	A_1	A_2	A_3
1	25	31	24
2	30	39	30
3	36	38	28
4	38	42	25
5	31	35	28

b. Set up on two way Anova analysis for the following two way design results. **10 L3 CO5**

Varieties of fertilizers	A	B	C
W	6	5	5
X	7	5	4
Y	3	3	3
Z	8	7	4

State whether variety differences are significant at 5% level given that $F_{2,6} = 5.14$ and $F_{3,6} = 4.76$.

OR

Q.10 **a.** Set up analysis of variance table for the following per acre production data for 3 varieties of wheat each grown on 4 plots and state if the variety differences are significant given $F_{2,9} = 4.26$. **10 L3 CO6**

Plot of land	Per acre production variety of wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

b. Analyse and interpret the following statistics concerning output of wheat per field obtained as a result of experiment conducted to test four varieties of wheat A, B, C, D under Latin square design given $F_{3,6} = 4.76$. **10 L3 CO6**

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}

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