CBCS SCHEME - Make-Up Exam

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BCS/BAD/BAI/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.
3. Statistical Tables and Mathematics formula Handbooks are allowed.

		Module – 1	M	L	C
1	a.	Derive Mean and Variance of Poisson Distribution.	6	L2	CO2
	b.	The probability that a pen manufactured by a factory be defective is $\frac{1}{10}$, if 12 such pens are manufactured. What is the probability that : i) Exactly two are defective ii) Atleast two are defective iii) None of them are defective	7	L3	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 $\phi(1) = 0.3413$]	7	L3	CO2
		OR			
Q.2	a.	The p.d.f of a variate X is given by the following table:	6	L2	CO1

x	0	1	2	3	4	5	6
p(x)	k	3k	5k	7k	9k	11k	13k

For what value of K, this represents a valid probability distribution?
Also find $p(x \geq 5)$ and $p(3 < x \leq 6)$.

	b.	The number of accidents in a year to taxi drivers in a city follows a poission distribution with mean 3. Out of 1000 taxi drivers find approximately the number of the drivers with i) No accident in a year ii) More than 3 accidents in a year.	7	L3	CO2
	c.	If x is a normal variate with mean 30 and standard deviation 5 find the probability that i) $26 \leq x \leq 40$ ii) $x \geq 45$	7	L2	CO2

Module – 2

Q.3	a.	The joint distribution of two random variables X and Y is as follows: Compute the following : E(X), E(Y), E(XY), COV(X,Y).	6	L2	CO3
	b.	Prove that the Markov Chain whose t.p.m is $P = \begin{bmatrix} 0 & 2/3 & 1/3 \\ 1/2 & 0 & 1/2 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ Is irreducible. Find the corresponding stationary probability vector.	7	L2	CO4
	c.	Three boys A, B, C are throwing ball to each other. A always throws the ball to B and B always throws the ball to C. C is just as likely to throw the ball to B as to A. If C was the first person to throw the ball find the probabilities that after three throws, B has the ball.	7	L3	CO4

Y \ X	-4	2	7
1	1/8	1/4	1/8
5	1/4	1/8	1/8

OR

Q.4	a.	Define: i) Probability Vector ii) Stochastic Matrix iii) Regular Stochastic Matrix.	6	L1	CO4
	b.	The joint probability distribution of two discrete random variables X and Y is given by $f(x, y) = K(2x + y)$. Where x and y are integers such that $0 \le x \le 2$, $0 \le y \le 3$. i) Find the value of K ii) $P(X = 1, Y = 2)$ iii) $P(X = 2, Y = 1)$ iv) $P(X \ge 1, Y \le 2)$	7	L2	CO3
	c.	The t.p.m of a Markov Chain is given by $P = \begin{bmatrix} 1/2 & 0 & 1/2 \\ 1 & 0 & 0 \\ 1/4 & 1/2 & 1/4 \end{bmatrix}$ and the initial probability distribution is $P^{(0)} = (1/2, 1/2, 0)$. Find $P_1^{(2)}$	7	L2	CO4

Module – 3

Q.5	a.	Define the following: i) Standard Error ii) Null Hypothesis iii) Critical values of Z-test.	6	L1	CO4
	b.	A 'die' is thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Show that the die cannot be regarded as an unbiased one.	7	L3	CO4

	c.	In an elementary school examination the mean grade of 32 boys was 72 with a standard deviation of 8, while the mean grade of 36 girls was 75 with a standard deviation of 6. Test the hypothesis that the performance of girls are better than boys.	7	L3	CO4
		OR			
Q.6	a.	Define : i) Type 1 error ii) Type 2 error iii) Significance level	6	L1	CO5
	b.	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 total of 200 flights. Is there a significant difference in the two types of aircrafts so far as engine defects are concerned?	7	L3	CO4
	c.	A sample of 900 days was taken in a coastal town and it was found that on 100 days the weather was very hot. Obtain the probable limits of the percentage of very hot weather.	7	L3	CO5
		Module – 4			
Q.7	a.	A random sample of size 64 is taken from an infinite population having mean 112 and variance 144. Using central limit theorem, find the probability of getting the sample mean $\overline{X}$ greater than 114.5 (ϕ (1.66) = 0.4515).	6	L2	CO5
	b.	Fit a poisson distribution for the following data and test the goodness of fit given that ($\Psi^2_{0.05}$ = 7.815 for 3d.f) x: 0, 1, 2, 3, 4 f: 122, 60, 15, 2, 1	7	L2	CO4
	c.	Ten individuals are choosen 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.f)	7	L3	CO4
		OR			
Q.8	a.	Suppose that 10, 12, 16, 19 is a sample taken from a normal population with variance 6.25. Find at 95% confidence interval for the population mean. (z = 1.96 at 95%)	6	L2	CO5
	b.	Two horses A and B were tested according to the time (in seconds) to run a particular race with the following results: Horse A : 28, 30, 32, 33, 33, 29, 34 Horse B : 29, 30, 30, 24, 27, 29 Test whether you can discriminate between the two horses ($t_{0.05}$ = 2.2 for 11 df)	7	L3	CO4

	c.	Two random samples drawn from two normal populations are: Sample – I: 20, 16, 26, 27, 22, 23, 18, 24, 19, 25, -, - Sample – II: 27, 33, 42, 35, 32, 34, 38, 28, 41, 43, 30, 37 Obtain the estimates of the variance of the population and test 5% level of significance whether the two populations have the same variance [$F_{11,9} = 3.10$]	7	L2	CO4
		Module – 5			
Q.9	a.	Three types of fertilizers are used on three groups of plants for 6 weeks. We want to check if there is a difference in the mean growth of each group. Using the data given below apply a one-way ANOVA test at 0.05 significance level. Fertilizer 1: 6, 8, 4, 5, 3, 4 Fertilizer 2: 8, 12, 9, 11, 6, 8 Fertilizer 3: 13, 9, 11, 8, 7, 12 (Given F(2, 15) = 3.68)	10	L3	CO6
	b.	The following data show the number of worms quarantined from the areas of four graphs of muskrats in a carbon tetrachloride anthelmintic study. Conduct a two-way ANOVA study. I: 33, 32, 26, 14, 30 II: 41, 38, 40, 23, 21 III: 12, 35, 46, 22, 11 IV: 38, 43, 25, 13, 26 (F(4, 12) = 3.26, F(3, 12) = 3.49)	10	L3	CO6
		OR			
Q.10	a.	A trial was run to check the efforts of different diets. Positive numbers indicate weight loss and negative number indicate weight gain. Check if there is an average difference in the weight of people following different diets using an ANOVA table: Low fat: 8, 9, 6, 7, 3 Low calorie: 2, 4, 3, 5, 1 Low protein: 3, 5, 4, 2, 3 Low carbohydrate: 2, 2, -1, 0, 3 (F(3, 16) = 3.24 at 5%)	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 five fertilizers which were used on plots of different fertility: 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 (F(4, 12) = 3.26)	10	L3	CO6