CBCS SCHEME

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BCS301

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
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. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the mean and variance of Poisson distribution.	06	L2	CO2
	b.	Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) atleast one boy (iii) at most 2 girls. Assume equal probabilities for boys and girls.	07	L3	CO2
	c.	The length of telephone conversation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth (i) ends less than 5 minutes (ii) between 5 and 10 minutes.	07	L2	CO2
		OR			
Q.2	a.	The probability distribution of a finite random variable X is given by X: -2, -1, 0, 1, 2, 3 P(X): 0.1, k, 0.2, 2k, 0.3, k (i) Find the value of k (ii) Variance (iii) $P(x \leq 2)$	06	L2	CO1
	b.	The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 1000 taxi drivers find approximately number of drivers with (i) more than 3 accidents in a year (ii) at most 2 accidents in a year.	07	L3	CO2
	c.	The marks of 1000 students in an exam follows normal distribution with mean 70 and standard deviation 5. Find the students whose marks will be (i) less than 65 (ii) between 65 and 75. A(1) = 0.3413.	07	L3	CO2
		Module – 2			
Q.3	a.	Given the following joint distribution of the random variables X and Y. Find the corresponding marginal distribution. Also compute the covariance. X \ Y: 1, 3, 9 2: 1/8, 1/24, 1/12 4: 1/4, 1/4, 0 6: 1/8, 1/24, 1/12	06	L3	CO2
	b.	A salesmen's territory consists of 3 cities A, B and C. He never sells in the same city for 2 consecutive days. If he sells in city A, then the next day he sells in city B. However if he sells in either B or C then the next day he is twice as likely to sell in city A as in the other city. In the long run how often does he sell in each of the cities.	07	L3	CO3
	c.	Show that $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is a regular stochastic matrix. Also find the associated unique fixed probability vector.	07	L2	CO2

		OR			
Q.4	**a.**	Define probability vector, regular stochastic matrix, fixed prob vector.	**06**	**L1**	**CO3**
	b.	The joint probability distribution of two discrete random variables X and Y is $f(x, y) = k(2x + y)$, where x and y are integers such that $0 \le x \le 2$, $0 \le y \le 3$. i) Find the value of the constant k. ii) Show that the random variables X and Y are dependent iii) Find $P(X \ge 1, Y \le 2)$.	**07**	**L3**	**CO2**
	c.	A fair coin is tossed thrice. The random variables X and Y are defined as X = 0 or 1 according as head or tail occurs on the first toss, y-number of heads. Compute e(X, Y)	**07**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Define statistical hypothesis, null hypothesis, Type-I error and Type-II error.	**06**	**L1**	**CO4**
	b.	In 324 throws of a six faced die an even number turned up 181 times. Is it reasonable to think that the 'die' is an unbiased one at 99% level?	**07**	**L2**	**CO4**
	c.	Before an increase in excise duty on tea, 800 people out of sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tea after the increase in duty at 1%. (One tailed test at 1% is 2.33).	**07**	**L3**	**CO4**
		OR			
Q.6	**a.**	A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased.	**06**	**L2**	**CO4**
	b.	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.	**07**	**L3**	**CO4**
	c.	A random sample for 1000 workers in company has mean wage of Rs.50 per day and standard deviation of Rs.15. Another sample of 1500 workers from another company has mean wage of Rs.45 per day and standard deviation of Rs.20. Does the mean rate of wages varies between the two companies at 95% confidence limit?	**07**	**L3**	**CO4**
		Module – 4			
Q.7	**a.**	The mean life time of a sample of 25 bulbs is found as 1550 hrs with standard deviation of 120 hours. The company manufacturing the bulbs claims that the average life of their bulbs is 1600 hrs. Is the claim acceptable at 5% level of significance?	**06**	**L3**	**CO4**
	b.	The two independent samples of eight and seven items respectively had the following values of the variable: Sample 1: 9, 11, 13, 11, 15, 9, 12, 14 Sample 2: 10, 12, 10, 14, 9, 8, 10 Do the two estimates of population variance differ significantly at 5% level of significance? F at 5% $(V_1 = 7, V_2 = 6) = 4.21$.	**07**	**L3**	**CO4**
	c.	Table gives the number of aircraft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week. $\chi^2_{5\%}(\gamma = 5) = 11.07$. Day: Mon, Tue, Wed, Thur, Fri, Sat Number of accidents: 15, 19, 13, 12, 16, 15	**07**	**L3**	**CO4**

OR

Q.8 **a.** Two random samples gave the following data:

	Size	Mean	Variance
Sample 1	8	9.6	1.2
Sample 2	11	16.5	2.5

Can we conclude that the two samples have been drawn from the same normal population? $F_{5\%}$ (10, 7) = 3.64. **06 L2 CO4**

b. The following data relate to the marks obtained by 11 students in two tests. Second test is after intense coaching. Do the data indicate that the students have benefited by coaching? **07 L3 CO4**

Test 1	19	23	16	24	17	18	20	18	21	19	20
Test 2	17	24	20	24	20	22	20	20	18	22	19

($t_{5\%}$ ($\gamma = 10$) is 1.81)

c. The mean value of a random sample of 60 items was found to be 145 and standard deviation is 40. Find the 95% confidence limits for the population mean. **07 L2 CO5**

Module – 5

Q.9 **a.** The following figures relate to production in kgs of three variables A, B, C of wheat sown on 12 plots. **10 L3 CO6**

A	14	16	18		
B	14	13	15	22	
C	18	16	19	19	22

Apply one-way Annova using a 0.05 significance level in the production of the varieties. F_c at 5% (2, 9) d.f is 4.26.

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. **10 L3 CO6**

C	B	A	D
25	23	20	20
A	D	C	B
19	19	21	18
B	A	D	C
19	14	17	20
D	C	B	A
17	20	21	15

OR

Q.10 **a.** Four doctors each test four treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows: **10 L3 CO6**

Doctor/Treatment	T_1	T_2	T_3	T_4
D_1	10	14	19	20
D_2	11	15	17	21
D_3	9	12	16	19
D_4	8	13	17	20

Discuss the difference between doctors and treatments F_{at} 5% level (3, 9) is 3.86.

	b.	A study of the effect of different types of anesthesia on the length of post-operative hospital stay yielded for the following for cesarean patients. Group 'A' was given an epidural MS providing additional safety. Group 'B' was given an epidural and Group 'C' was given a spinal is considered to be less dangerous and Group 'D' was given general anesthesia is considered to be the most dangerous. Note that the data are in the form of distribution for each group.	10	L3	CO6

	Length of Stay	Number of patients
Group A	3	6
	4	14
Group B	4	18
	5	2
Group C	4	10
	5	9
	6	1
Group D	4	8
	5	12

Test for the existence of an effect due to anesthesia type at 0.01. $F_{0.01} = 4.13$

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