Model Question Paper-I (CBCS Scheme)

USN										

Third Semester B.E Degree Examination

MATHEMATICS FOR CS ENGINEERING STREAM (BCS301)

TIME: 03 Hours **Max.Marks:100**

Note: (i) Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE.**
(ii) Statistical tables and Mathematics Formula handbooks are allowed.

		Module -1	M	L	C
Q.01	a	A shipment of 8 similar microcomputers to a retail outlet contains 3 that are defective. If a school makes a random purchase of 2 of these computers, find the probability distribution for the number of defectives. Find the mean and variance of this distribution.	**6**	**L2**	**CO1**
	b	In a factory producing blades, the probability of any blade being defective is 0.002. If blades are supplied in packets of 10, Using Poisson distribution determine the number of packets containing i. No defective ii. One defective and iii. Two defective blades respectively in a consignment of 10000 packets	**7**	**L2**	**CO1**
	c	If the mileage (in thousands of miles) of a certain radial tyre is a random variable with exponential distribution with mean 40,000 miles. Determine the probability that the tyre will last i. At least 20,000 km ii. At most 30,000 km	**7**	**L3**	**CO1**
		OR			
Q.02	a	The density function of a random variable X is given by $f(x) = \begin{cases} k\sqrt{x}, & 0 < x < 1 \\ 0, & elsewhere \end{cases}$, i. Find k ii. Find the cdf F(x) and use it to evaluate $P[0.3 < X < 0.6]$	**6**	**L2**	**CO1**
	b	Find the mean and variance of Binomial distribution.	**7**	**L2**	**CO1**

	c	In a test on 2000 electric bulbs, it was found that the life of a particular make , was normally distributed with an average life 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for i. More than 2150 hours ii. Less than 1950 hours iii. In between 1920 and 2160 hours	**7**	**L3**	**CO1**
		Module-2			
Q. 03	a	The joint probability distribution of two random variables X and Y is <table><tr><td>Y \ X</td><td>-4</td><td>2</td><td>7</td></tr><tr><td>1</td><td>1/8</td><td>1/4</td><td>1/8</td></tr><tr><td>5</td><td>1/4</td><td>1/8</td><td>1/8</td></tr></table> Find the marginal distributions. Obtain the correlation coefficient between X and Y.	**6**	**L2**	**CO2**
	b	Find the unique fixed probability vector of P = $\begin{pmatrix} 0 & \frac{3}{4} & \frac{1}{4} \\ \frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 1 & 0 \end{pmatrix}$	**7**	**L2**	**CO2**
	c	Every year, a man trades his car for a new car. If he has a Maruti, he trades it for an Ambassador. If he has an Ambassador, he trades it for Santro. However, if he had a Santro, he is just as likely to trade it for a new Santro as to trade it for a Maruti or an Ambassador. In 2000 he bought his first car which was a Santro. Find the probability that he has i. 2002 Santro ii. 2002 Maruti iii. 2003 Ambassador iv. 2003 Santro	**7**	**L3**	**CO2**
		OR			
Q.04	a	The joint probability distribution of two random variables X and Y is <table><tr><td>Y \ X</td><td>-3</td><td>2</td><td>4</td></tr><tr><td>1</td><td>0.1</td><td>0.2</td><td>0.2</td></tr><tr><td>3</td><td>0.3</td><td>0.1</td><td>0.1</td></tr></table> i. Are X and Y independent?	**6**	**L2**	**CO2**

		ii. Evaluate $P[Y \leq 2]$ iii. Evaluate $P[X+Y \leq 2]$			
	b	Define Probability Vectors, Stochastic matrices, Regular stochastic matrix, stationary distribution and absorbing state of Markov chain.	**7**	**L1**	**CO2**
	c	A salesman's territory consists of 3 cities A, B and C. He never sells in the same city on successive 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 other city. In long run, how often does he sell in each of the cities.	**7**	**L3**	**CO2**
		Module-3			
Q. 05	a	Define Null hypothesis, significance level, critical region, Type-I and type-II errors in a statistical test.	**6**	**L1**	**CO3**
	b	A coin was tossed 400 times and head turned up 216 times. Test the hypothesis that the coin is un biased at 5% level of significance.	**7**	**L3**	**CO3**
	c	In a city A 20 % of a random sample of 900 school boys had a certain slight physical defect. In another city B, 18.5% of a random sample of 1600 school boys had the same defect. Is the difference between the proportions significant at 5% significance level	**7**	**L3**	**CO3**
		OR			
Q. 06	a	Explain the following terms i. Standard error ii. Statistical hypothesis iii. Critical region of a statistical test iv. Test of significance	**6**	**L1**	**CO3**
	b	A die was thrown 9000 times and a throw of 5 or 6 was obtained 3240 times. On the assumption of random throwing, do the data indicate an unbiased die at 1% level of significance.?	**7**	**L3**	**CO3**
	c	In a sample of 600 men from a certain city, 450 are found smokers. In another sample of 900 men from another city, 450 are smokers. Do the indicate that the cities are significantly different with respect to the habit of smoking among men. Test at 5% significance level.	**7**	**L3**	**CO3**
		Module-4			
Q. 07	a	State Central limit theorem. Use the theorem to evaluate $P[50 < \bar{X} < 56]$ where $\bar{X}$ represents the mean of a random sample of size 100 from an infinite population with mean $\mu = 53$ and variance $\sigma^2 = 400$	**6**	**L2**	**CO4**
	b	A random sample of size 25 from a normal distribution $N(\mu, \sigma^2 = 4)$ yields, sample mean $\bar{X} = 78.3$. Obtain a 99% confidence interval for μ.	**7**	**L2**	**CO4**
	c	A survey of 320 families with 5 children each revealed the following distribution. No. of boys: 5 | 4 | 3 | 2 | 1 | 0	**7**	**L3**	**CO4**

		No. of girls	0	1	2	3	4	5			
		No. of families	14	56	110	88	40	12			
		Is the result consistent with the hypothesis that male and female births are equally probable at 5% level of significance.									
		OR									
Q. 08	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 $\bar{X}$ greater than 114.5							**6**	**L2**	**CO4**
	b	Let the observed value of the mean $\bar{X}$ of a random sample of size 20 from a normal distribution with $mean\ \mu$ and variance $\sigma^2 = 80$ be 81.2. Find a 90% and a 95% confidence intervals for μ.							**7**	**L2**	**CO4**
	c	The nine items of a sample have the following values: 45, 47, 50, 52, 48, 47, 49, 53, 51. Does the mean of these differ significantly from the assumed mean of 47.5 at 5% significance level?							**7**	**L3**	**CO4**
		Module-5									
Q. 09	a	Three different kinds of food are tested on three groups of rats for 5 weeks. The objective is to check the difference in mean weight (in grams) of the rats per week. Apply one-way ANOVA using a 0.05 significance level to the following data:							**10**	**L3**	**CO5**
		Food 1	**8**	**12**	**19**	**8**	**6**	**11**			
		Food 2	**4**	**5**	**4**	**6**	**9**	**7**			
		Food 3	**11**	**8**	**7**	**13**	**7**	**9**			
	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**	**CO5**
		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						

OR					
Q. 10	a	Set up an analysis of variance table for the following per acre production data for three varieties of wheat, each grown on 4 plots and state it the variety differences are significant at 5% significant level	**10**	**L3**	**CO5**
	b	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	**10**	**L3**	**CO5**

Per acre production data

Plot of land	Variety of Wheat		
	A	B	C
1	6	5	5
2	7	5	4
3	3	3	3
4	8	7	4

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%