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PAPER CODE	U213-243 (RE)

December 2023 (REEXAM)

SY B.TECH (SEMESTER - I)

COURSE NAME: PROBABILITY AND STATISTICS **Branch: CSE AI** **COURSE CODE: ES21203CA**

(PATTERN 2020)

Time: [2 Hrs] **[Max. Marks: 60]**

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data wherever required**
4) **All questions are compulsory. Solve any two sub questions each from each Question 1 ,2, 3, 4, 5, and 6 respectively**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) In a group of 12 employees of a company, 5 are graduates and 7 are non graduates. If 2 persons are selected at random from this group find the probability that the first of them is graduate and the second is non graduate. Draw a tree diagram for the solution.	[5]	CO1	Apply
	b) In a neighbourhood, 90% children were falling sick due flu and 10% due to measles and no other disease. The probability of observing rashes for measles is 0.95 and for flu is 0.08. If a child develops rashes, find the child's probability of having flu.	[5]	CO1	Apply
	c) A bean contain 20 machine parts 4 of which are defective. If 2 machine parts are selected at random (without replacement) from this box, what is the probability that both parts are defective? Draw the tree diagram.	[5]	CO1	Apply
Q2	a) A professional basket player makes 80 % of the free throws he tries. Assuming this percentage hold true for future attempts find the probability that in the next eight tries the number of free throws he will make is exactly 8, and second exactly 5.	[5]	CO2	Apply
	b) The following table gives the probability distribution of a discrete random variable x. Find the following probability.	[5]	CO2	Apply

x	0	1	2	3	4	5	6
P(x)	0.11	0.14	0.18	0.15	0.12	0.09	0.05

P(x = 4) ii) P(x ≥ 3) iii) P(x < 3) iv) P(3 ≤ x ≤ 5)

0.12 ii) 0.41 iii) 0.43 iv) 0.36

	c) Given $f(x) = 1.5x^2$ for $-1<x<1$. Find the mean and variance of x	[5]	CO2	Apply
Q3.	a) The contents of bottles of oil are Normally distributed with a mean of 300 ml and a standard deviation of 5 ml. What is the probability that the total contents of a six-pack will be between 1758 ml and 1842 ml?	[5]	CO3	Apply
	b) The ages of six executives of a company are Name: Veena 54; Shanti 50; Suresh 52; Rajiv 48; Anil 50; Ravi 52 How many samples of size 2 are possible? Construct the sampling distribution of means by taking samples of size 2 and organise the data. Calculate the mean of the sampling distribution and compare it with the population mean.	[5]	CO3	Apply
	c)Consider the Markov chain with three states S={1,2,3} that has the following transition matrix $P=\begin{pmatrix} ½ & ¼ & ¼ \\ 1/3 & 0 & 2/3 \\ ½ & ½ & 0 \end{pmatrix}$ Draw the state transition diagram for this chain and if we know P(x1=1) = P(x2=2) = 1/4 find P(x1=3, x2=2, x3=1)	[5]	CO3	Apply
Q.4	a) Consider a simple weather model with two states: "Sunny" (S) and "Rainy" (R). The transition probabilities for a one-step transition are given by the matrix: $P=\begin{pmatrix} 0.8 & 0.2 \\ 0.4 & 0.6 \end{pmatrix}$ This matrix represents the probability of transitioning between sunny and rainy days. Find the probability of having a sunny day tomorrow given that today is sunny ($P(X_{t+1} = S \mid X_t = S)$).	[5]	CO4	Apply
	b) The following GPA score of 30 students of Engineering. Find the sample mean and standard deviation. Calculate Mean, median and mode. GPA Scores = 3.1, 2.9, 2.8, 2.9, 3.8, 4.8, 4.2, 3.9, 3.4, 2.5, 4.2, 3.7, 3.3, 2.1, 3.8, 3.0, 3.7, 4.0, 2.7, 3.8, 3.2, 3.5, 3.5, 3.6, 2.2, 3.1, 3.5, 4.0, 2.7, 4.5.	[5]	CO4	Apply

	c) Assume there are two species of green beings on Mars. The mean height of Species-1 is 32 while the mean height of Species-2 is 22. The variances of the two species are 60 and 70, respectively and the heights of both species are normally distributed. You randomly sample 10 members of Species-1 and 14 members of Species-2. What is the probability that the mean of the 10 members of Species-1 will exceed the mean of the 14 members of Species-2 by 5 or more?	[5]	CO4	Apply
Q.5	a) Explain the use of special significance tests for large and small samples (F-test, chi-square, z-test, t-test, ANOVA).	[5]	CO5	Understand
	b) Solve the following using Chi square test. Let's say you want to know if gender has anything to do with the decision on voting preference of an office staff. You poll 75 voters in a simple random sample to find out which decision they prefer. The results of the survey are shown in the table below.	[5]	CO5	Apply
	c) Differentiate Type I and Type II errors in the context of hypothesis testing. Provide examples.	[5]	CO5	Analyze
Q.6)	a) Illustrate the correlation coefficient, rank correlation and its types.	[5]	CO5	Understand
	b) Find the multiple linear regression equation along with value of coefficient to fit the following data.	[5]	CO5	Apply
	c) Estimate a linear regression equation for the following two sets of data. Find value of b and a with equation of line.	[5]	CO5	Apply

	Agree	Undecided	Disagree
Male	10	13	11
Female	15	12	14

X1	X2	Y
1	4	1
2	5	6
3	8	8
4	2	12

X	3	5	7	9	9
Y	4	8	9	6	11

31/01/24