

II/IV B. Tech. DEGREE EXAMINATIONS, FEB / MAR - 2023**First Semester****ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING****PROBABILITY & STATISTICS**Time : **Three Hours**Maximum : **70 Marks****Answer All Questions****Answer ONE question from each Unit.****5x14=70 M****UNIT - I**

1. a) Find the rank correlation for the following data :

x	56	42	72	36	63	47	55	49	38
y	147	125	160	118	149	128	150	145	115

- b) Describe about the following Moments, Skewness and Kurtosis.

(OR)

2. a) From the following data calculate moments about (i) Assumed mean 25 (ii) Actual mean.

Variable	0-10	10-20	20-30	30-40
Frequency	1	3	4	2

- b) Write short notes on methods of least squares.

UNIT - II

3. a) Explain with example for the (i) Axioms of Probability (ii) Event (iii) Independent events.

- b) A basket contains 30 white and 10 black balls, while another basket contains 10 white and 15 black balls. Two balls are drawn from the first basket and put into the second basket and then a ball is drawn from the latter. What is the probability that it is a white ball ?

(OR)

P.T.O.

4. a) A richman goes to hotels X, Y, Z, 20%, 50%, 30% of the time respectively. It is known that 5%, 4%, 8% of the rooms in X, Y, Z hotels have faulty plumbings. What is the probability that richman's room having faulty plumbing is assigned in hotel Z.
- b) State and Prove Addition theorem on Probability.

UNIT - III

5. a) State and explain about Bayes's theorem with suitable example.
- b) For the following probability distribution :

x	-3	-2	-1	0	1	2	3
p(x)	0.001	0.01	0.1	0.2	2K	0.4	2K

Then find (i) K (ii) Mean and Variance (iii) $E(X^2+2X+3)$.

(OR)

6. The marks obtained in Mathematics by 1000 students is normally distributed with mean 78% and standard deviation 11%. Determine
- (i) How many students got marks above 90%.
- (ii) What was the highest mark obtained by the lowest 10% of the students.
- Within what limits did the middle of 90% of the students lie.

UNIT - IV

7. a) Two samples of size 9 and 8 give the sum of squares of deviations from their respective means equal 160 inches and 91 inches square respectively. Can they be regarded as drawn from two normal populations with the same variance ? (F for 8 and 7 d.f. = 3.73).
- b) Explain about the null hypothesis and alternate hypothesis.

(OR)

8. a) Samples of students were drawn from two universities and from their weights in kilograms, mean and standard deviations are calculated and shown below. Make a large sample test to test the significance of the difference between the means

	Mean	S.D	Size of the sample
University A	55	10	400
University B	57	15	100

- b) Explain about Critical region, Type-I and Type-II errors.

UNIT - V

9. a) What is the purpose of testing of equality of variances ? Explain.
b) How t-distribution happen for single and two means ? Explain.

(OR)

10. On the basis of information given below about the treatment of 200 patients suffering from a disease, state whether the new treatment is comparatively superior to the conventional treatment.

	Favourable	Not favourable	Total
New	60	30	90
Conventional	40	70	110



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1. a) For the following data determine (i) least squares regression line of y on x (ii) y(3) (iii) least squares regression line of x on y (iv) x(4).

x	6	5	8	8	7	6	10	4	9	7
y	8	7	7	10	5	8	10	6	8	6

- b) The two regressions of the variables x and y are $x=19.13-0.87y$ and $y=11.64-0.50x$. Find (i) mean of x's (ii) mean of y's (iii) the correlation coefficient between x and y.

(OR)

2. a) For two random variables x and y with the same mean, the two regression lines are $y=ax+b$ and $x=cy+d$. Show that $\frac{b}{d} = \frac{1-a}{1-c}$
- b) Describe (i) Mean (ii) Variance (iii) Spearman Correlation coefficient.

UNIT-II

3. a) If 5 of 20 tyres in storage are defective and 5 of them are randomly chosen for inspection (that is, each tire has the same chance of being selected), what is the probability that the two of the defective tyres will be included?
- b) Explain about properties of probability density functions.

(OR)

4. a) If $P(A)=1/2$, $P(B)=1/3$, $P(A/B)=1/5$ then find (i) $P(A \cup B)$ (ii) $P(A^c / B)$ (iii) $P(A / B^c)$
b) A basket contains 30 white and 10 black balls, while another basket contains 10 white and 15 black balls. Two balls are drawn from the first basket and put into the second basket and then a ball is drawn from the latter. What is the probability that it is a white ball?

UNIT-III

5. a) For any normally distributed variate with mean 1 and standard deviation 3, find the probabilities of (i) $3.43 \leq x \leq 6.19$ (ii) $-1.43 \leq x \leq 6.19$
b) For the following probability distribution

x	-3	-2	-1	0	1	2	3
P(x)	0.001	0.01	0.1	0.2	2K	0.4	2K

Then find (i) K (ii) Mean and Variance (iii) $E(X^2+2X+3)$.

(OR)

6. a) If a Poisson distribution is such that $P(X=1) \frac{3}{2} = P(X=3)$ then find (i) $P(x \geq 1)$ (ii) $P(x \leq 3)$
(iii) $P(2 \leq x \leq 5)$
b) In a Normal distribution, 7% of the items are under 35 and 89% are under 63. Find the mean and standard deviation of the distribution

UNIT-IV

7. a) Explain about the null hypothesis and alternate hypothesis.
b) Records taken of the number of male and female births in 830 families having four children are as follows:

Number of male births	0	1	2	3	4
Number of female births	4	3	2	1	0
Number of families	32	178	290	236	94

Test whether the data are consistent with hypothesis that the Binomial law holds and the chance of male birth is equal to that of female birth, namely $p = q = 1/2$. [χ^2 at 5% level of significance for 4 df is 9.49]

(OR)

8. a) Experience had shown that 20% of a manufactured product is of the top quality. In one day's production of 400 articles only 50 are of top quality. Test the hypothesis at 0.05 level and find confidence limits.
- b) Explain about Critical region, Type-I and Type-II errors.

UNIT-V

9. a) Write about working rule for test of hypothesis for small samples.
- b) The mean life of a sample of 25 fluorescent lights bulbs produced by a company is computed to be 1570 hours with a standard deviation of 120 hours. The company claims that the average life of the bulbs produced by the company is 1600 hours. Using the level of significance of 0.05, is the claim acceptable.

(OR)

10. a) Write short notes on F-test and χ^2 -test.
- b) A pair of dice is thrown 360 times and the frequency of each sum is indicated below.

Sum	2	3	4	5	6	7	8	9	10	11	12
Frequency	8	24	35	37	44	65	51	42	26	14	14

Would you say that the dice are fair on the basis of the chi-square test at 0.05 level of significance?

