

**II B. Tech II Semester Regular/Supplementary Examinations, July - 2023**

**PROBABILITY AND STATISTICS**

(Common to CSE, CST, CSD, CSE(AIML), CSE(AI), CSE(DS), CSE(AI&DS), CSE(AI&ML), CSE(CS),  
CSE(DS), CSE(IOTCSIBCT), CSE(CSBS), CSE(IOT), AI&DS, CS, & AI&ML)

**Time: 3 hours**

**Max. Marks: 70**

Answer any **FIVE** Questions, each Question from each unit  
All Questions carry **Equal** Marks

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UNIT-I

- 1 a) Describe primary and secondary data with an example each. [7M]  
b) What are the measures of central tendency? Explain each. [7M]

**Or**

- 2 a) List any ten applications of data science. [7M]  
b) Distinguish between positive and negative Skewness. [7M]

UNIT-II

- 3 a) Calculate coefficient of correlation for the following data [7M]

|   |    |    |    |    |    |    |    |   |   |
|---|----|----|----|----|----|----|----|---|---|
| X | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2 | 1 |
| Y | 15 | 16 | 14 | 13 | 11 | 12 | 10 | 8 | 9 |

- b) The given following data based on 450 students, are given for marks in statistics are [7M]  
Economics at a certain examination.  
Mean marks in statistics=40  
Mean marks in Economics = 8  
S.D. of marks in statistics = 12  
Variance of marks(Economics) = 256  
Sum of the products of deviations of marks from this respective mean 42075. Give the equations of the two lines of regression and estimate the average marks in Economics of candidates who obtained 50 marks in statistics.

**Or**

- 4 a) Fit a least square straight line for the following data: [7M]

|   |      |      |      |      |      |      |      |
|---|------|------|------|------|------|------|------|
| X | 20   | 25   | 30   | 35   | 40   | 45   | 50   |
| Y | 0.18 | 0.37 | 0.35 | 0.78 | 0.56 | 0.75 | 1.18 |

- b) List the properties of Correlation coefficients. [7M]

UNIT-III

- 5 a) Define (i) Sample space (ii) Mutually exclusive events (iii) Compound event [7M]  
(iv) Dependent and independent events.

- b) A, B, C are aiming to shoot a balloon. A will succeed 4 times out of 5 attempts. The chance of B to shoot the balloon is 3 out of 4 and that of C is 2 out of 3. If the three aim the balloon simultaneously, then find the probability that at least two of them hit the balloon. [7M]

**Or**

- 6 a) List the properties of discrete and continuous random variables. [7M]  
b) If the probability density function  $f(x)$  of a continuous random variable is given by [7M]

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 \leq x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

Find the probabilities that a random variable having this probability density will take on a value (i) between 0.2 and 0.8 (ii) between 0.6 and 1.2.

## UNIT-IV

- 7 a) A random sample of 500 points on a heated plate resulted in an average temperature of 73.54 degrees Fahrenheit with a standard deviation of 2.79 degree Fahrenheit. Find a 99% confidence interval for the average temperature of the plate. [7M]  
b) Define unbiased estimator. What is the more efficient unbiased estimator, explain briefly? [7M]

## Or

- 8 a) A random sample of 100 teachers in a large metropolitan area revealed a mean weekly salary of Rs.487 with a standard deviation Rs.48. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 472 to 502? [7M]  
b) Define (i) Population and samples (ii) Sampling distribution (iii) F distribution. [7M]

## UNIT-V

- 9 a) Explain the procedure generally followed in testing of hypotheses. [7M]  
b) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95% confidence interval for the population. [7M]

## Or

- 10 a) The mean life time of a sample of 100 light tubes produced by a company is found to be 1560 hrs with a population S.D of 90 hrs. Test the hypothesis for  $\alpha=0.05$  that the mean life time of the tubes produced by the company is 1580 hrs. [7M]  
b) The average marks scored by 32 boys is 72 with a S.D of 6. Does This indicate that the boys perform better than girls at level of significance 0.05? [7M]



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## UNIT-I

- 1 a) Define dependent, independent, Categorical and Continuous variables with an example each. [7M]  
b) What are the measures of variability and explain them. [7M]

Or

- 2 a) Define descriptive statistics and give any five applications in computer science Engineering. [7M]  
b) Define Kurtosis. How does it differ from skewness. [7M]

## UNIT-II

- 3 a) Calculate coefficient of correlation for the following data. [7M]

|   |    |    |    |    |    |    |    |   |   |
|---|----|----|----|----|----|----|----|---|---|
| X | 9  | 8  | 7  | 6  | 5  | 4  | 3  | 2 | 1 |
| Y | 15 | 16 | 14 | 13 | 11 | 12 | 10 | 8 | 9 |

- b) For the following data, find equations of the two regression lines. [7M]

|   |    |    |    |    |    |
|---|----|----|----|----|----|
| X | 1  | 2  | 3  | 4  | 5  |
| Y | 15 | 25 | 35 | 45 | 55 |

Or

- 4 a) Fit a second degree polynomial to the following data by the method of least squares. [7M]

|   |   |     |     |     |     |
|---|---|-----|-----|-----|-----|
| X | 0 | 1   | 2   | 3   | 4   |
| Y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |

- b) From the following data calculate the rank correlation coefficient after making adjustment for tied ranks. [7M]

|   |    |    |    |   |    |    |    |    |    |    |
|---|----|----|----|---|----|----|----|----|----|----|
| X | 48 | 33 | 40 | 9 | 16 | 16 | 65 | 24 | 16 | 57 |
| Y | 13 | 13 | 24 | 6 | 15 | 4  | 20 | 9  | 6  | 19 |

## UNIT-III

- 5 a) State and prove Baye's theorem. [7M]  
b) In a normal distribution, 25% of the items are under 40 and 12% of the items are over 72. Find the mean S.D. of the distribution. [7M]

Or

- 6 a) From a lot of 10 items containing 3 defectives, a sample of 4 items is drawn at random. Let the random variable X denote the number of defective items in the sample. Find the probability distribution of X when the sample is drawn without replacement. [7M]  
b) The probability that a man hitting a target is  $1/3$ . If he fires 6 times, find the probability that he fires (i) at most 5 times (ii) Exactly once (iii) At least two times. [7M]

## UNIT-IV

- 7 a) A random sample of 350 points on a heated plate resulted in an average temperature of 68.45 degrees Fahrenheit with a standard deviation of 1.56 degree Fahrenheit. Find a 95% confidence interval for the average temperature of the plate. [7M]
- b) What is the size of the smallest sample required to estimate an unknown proportion to within a maximum error of 0.06 with at least 95% confidence. [7M]

**Or**

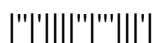
- 8 a) Explain point and interval estimations. [7M]
- b) A research worker wants to determine the average time it takes a mechanic to rotate the tyres of a car and he wants to be able to assert with 98.5% Confidence that the mean of his sample is off by at most 0.5 minutes. If he can presume from past experience that  $\sigma = 1.6$  minutes, how large a sample will have to take? [7M]

## UNIT-V

- 9 a) Explain the types of errors in sampling. [7M]
- b) A sample of 64 students have a mean weight of 70 kgs, Can this be regarded as a sample from a population with mean weight 56 kgs and standard deviation 25 kgs with level of significance 0.05 ? [7M]

**Or**

- 10 a) Write about [7M]
- (i) critical region
  - (ii) level of significance
  - (iii) critical value
- b) In a big city 285 men out of 550 men were found to be smokers. Does this information support the conclusion that the majority of men in this city are smokers? [7M]



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Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit  
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## UNIT-I

- 1 a) Discuss various methods of collecting primary data. [7M]

- b) Calculate the standard deviation for the following distribution. [7M]

|   |   |   |    |    |    |    |    |
|---|---|---|----|----|----|----|----|
| X | 4 | 8 | 11 | 17 | 20 | 24 | 32 |
| F | 3 | 5 | 9  | 5  | 4  | 3  | 1  |

Or

- 2 a) The coefficients of variations of two distributions are 60 and 70 and their standard deviations are 21 and 16 respectively. Find their arithmetic means. [7M]

- b) Calculate Karl Pearson's coefficient of skewness for the following data: [7M]

|           |     |      |       |       |       |       |       |       |
|-----------|-----|------|-------|-------|-------|-------|-------|-------|
| Variable  | 0-5 | 5-10 | 10-15 | 15-20 | 20-25 | 25-30 | 30-35 | 35-40 |
| Frequency | 2   | 5    | 7     | 13    | 21    | 16    | 8     | 3     |

## UNIT-II

- 3 a) Fit a straight line to the data given below: [7M]

|   |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|
| X | 1   | 3   | 5   | 7   | 9   |
| y | 1.5 | 2.8 | 4.0 | 4.7 | 6.0 |

- b) Calculate the coefficient of correlation between X and Y from the following data. [7M]

|   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|
| X | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Y | 2 | 4 | 5 | 3 | 8 | 6 | 7 |

Or

- 4 a) Following are the ranks obtained by 10 students in two subjects, Statistics and Mathematics. To what extent the knowledge of the students in two subjects is related? [7M]

|             |   |   |   |   |   |   |   |    |   |    |
|-------------|---|---|---|---|---|---|---|----|---|----|
| Statistics  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8  | 9 | 10 |
| Mathematics | 2 | 4 | 1 | 5 | 3 | 9 | 7 | 10 | 6 | 8  |

- b) Find the curve of best fit of the type  $y=ae^{bx}$  [7M]

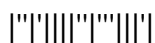
|   |    |    |    |    |    |
|---|----|----|----|----|----|
| X | 1  | 5  | 7  | 9  | 12 |
| y | 10 | 15 | 12 | 15 | 21 |

## UNIT-III

- 5 a) The probability of a man hitting a target is  $\frac{1}{4}$ . If he fixes 7 times, what is the probability of hitting the target at least twice. [7M]

- b) Average number of accidents on any day on a national highway is 1.6. Determine the probability that the number of accidents are (i) at least one (ii) at most one. [7M]

Or



- 6 a) A sample of 3 items is selected at random from a box containing 10 items of which 4 are defective. Find the expected number of defective items. [7M]
- b) If  $X$  is a normal variate with mean 30 and standard deviation 5. Find  $P(26 \leq x \leq 40)$  [7M]

## UNIT-IV

- 7 a) Define:  $t$ ,  $F$  and chi square test. [7M]
- b) Among 100 fish caught in a large lake, 18 were inedible due to the pollution of the environment. With what confidence can we assert that the error of this estimate is at most 0.065? [7M]

## Or

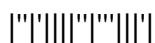
- 8 a) Show that  $\bar{x}$  is an unbiased estimator of the population mean  $\mu$  [7M]
- b) A random sample of 400 items is found to have mean 82 and S.D of 18. Find the maximum error of estimation at 95% confidence interval. Find the confidence limits for the mean if  $\bar{x} = 82$ . [7M]

## UNIT-V

- 9 a) In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. Can we reject the null hypothesis is  $\mu = 32.6$  minutes in favour of alternative null hypothesis  $\mu > 32.6$  at  $\alpha = 0.025$  level of significance. [7M]
- b) Explain one tailed and two tailed tests with an example each. [7M]

## Or

- 10 a) In a random sample of 125 cool drinkers, 68 said they prefer thumsup to pepsi. Test the null hypothesis  $p = 0.5$  against the alternative hypothesis  $P > 0.5$ . [7M]
- b) A random sample of 500 pineapples was taken from a large consignment and 65 were found to be bad. Find the percentage of bad pineapples in consignment. [7M]



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Time: 3 hours

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UNIT-I

- 1 a) What are the types of Big data visualization categories. Explain Bar graph. [7M]  
b) Find the variance and standard deviation of the following data. [7M]  
5,12,3,18,6,8,2,10.

**Or**

- 2 a) Calculate Karl pearson's coefficient of skewness for the following data: [7M]  
25,15,23,40,27,25,23,25,20.  
b) Explain the terms i) Lepto Kurtie (ii) Meso Kurtie (iii) Platy Kurtie. [7M]

UNIT-II

- 3 a) Determine the equation of a straight line which best fits the data. [7M]
- |   |    |    |    |    |    |    |    |
|---|----|----|----|----|----|----|----|
| X | 10 | 12 | 13 | 16 | 17 | 20 | 25 |
| Y | 10 | 22 | 24 | 27 | 29 | 33 | 37 |
- b) Define Rank correlation coefficient and List the properties. [7M]

**Or**

- 4 a) The equations of two regression lines are  $7x-16y+9=0$  and  $5y-4x-3=0$ . Find the coefficient of correlation and the means of x and y. [7M]  
b) Calculate the coefficient of correlation between X and Y. [7M]

X	1	2	3	4	5	6	7	8	9
Y	12	11	13	15	14	17	16	19	18

UNIT-III

- 5 a) In a factory, machine A produces 40% of the output and machine B produces 60%. On the average, 9 items in 1000 produced by A are defective and 1 item in 250 produced by B is defective. An item drawn at random from a day's output is defective. What is the probability that it was produced by A or B? [7M]  
b) A random variables X has the following probability function [7M]

X	0	1	2	3	4	5	6
P(X)	k	3k	5k	7k	9k	11k	13k

Find K ? (ii) What will be the minimum value of k so that  $P(X \leq 2) > 0.3$ ?

**Or**

- 6 a) Define : (i) Binomial (ii) Poission (iii) Uniform and (iv) Normal distributions. [7M]  
b) Derive Mean of Normal distribution. [7M]



## UNIT-IV

- 7 a) Find 95% confidence limits for the mean of a normality distributed population from which the following sample was taken 15,17,10,18,16,9,7,11,13,14. [7M]  
b) The mean of random sample is an unbiased estimate of the mean of the population 3,6,9,15,27. Then List the possible samples of size 3 that can be taken without replacement from the finite population. [7M]

**Or**

- 8 a) A random sample of 125 teachers in a large metropolitan area revealed a mean weekly salary of Rs. 527 with a standard deviation Rs. 45. With what degree of confidence can we assert that the average weekly salary of all teachers in the metropolitan area is between 495 to 532? [7M]  
b) In a random sample of 100 packages shipped by air freight 13 had some damage, Construct 95% confidence interval for the true proportion of damage package. [7M]

## UNIT-V

- 9 a) A sample of 100 iron bars is said to be drawn from a large number of bars whose lengths are normally distributed with mean 4 feet and S.D. 0.6 feet. If the sample mean is 4.2 feet. can the sample be regarded as a truly random sample. [7M]  
b) 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. [7M]

**Or**

- 10 a) Write the test statistic for (i) the test of significance for single mean (ii) for the test of significance for single proportion and (iii) difference of means. [7M]  
b) The means of two large samples of sizes 1000 and 2000 members are 67.5 inches and 68.0 inches respectively. Can these samples be regarded as drawn from the same population of S.D. 2.5 inches? [7M]

