

**School of Engineering****B.TECH Civil Engineering  
Semester End Examination - Jun 2024****Duration : 180 Minutes  
Max Marks : 100****Sem IV - C1UC421T - Probability and Statistics**General Instructions*Answer to the specific question asked**Draw neat, labelled diagrams wherever necessary**Approved data hand books are allowed subject to verification by the Invigilator*

- 1) Explain rank correlation K1(3)
- 2) Define ANOVA. What is the use of one-way ANOVA? K2(4)
- 3) Here are the number of goals scored by a school football team in their matches this term. K2(6)  
3, 2, 0, 1, 2, 0, 3, 4, 3, 2
  1. Find out the mean number of goals.
  2. Work out the range of the number of goals scored.
- 4) The table show the minimum and maximum temperatures recorded in six cities one day last year K3(6)

City	Max.	Min.
Los Angeles	220C	120C
Boston	220C	30C
Moscow	180C	90C
Atlanta	270C	80C
London	130C	150C
Cairo	280C	130C

  1. Analyse the range of temperature for Atlanta?
  2. Which city in the table had the lowest temperature?
  3. Analyse the difference between the maximum temperature and the minimum temperature for Moscow
- 5) A researcher wants to test if the mean weight of a sample of 30 participants is significantly different from 150 pounds. The sample mean weight is 155 pounds with a standard deviation of 10 pounds. Conduct a one-sample t-test at a 0.01 significance level K3(6)
- 6) The number of failures occurring in a machine of a certain type in a year has a Poisson distribution with mean 0.4. In a factory there are ten of these machines. Find (a) the expected total number of failures in the factory in a year? (b) the probability that there are fewer than two failures in the factory in a year? K3(9)

- 7) Consider a random variable X with probability density function K3(9)
- $$f(x) = \begin{cases} 4x^3, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$
- Find E(X) and V(X).
- 8) Let X be continuous random variable with pdf K4(8)
- $$f(x) = \begin{cases} ax & 0 \leq x < 1 \\ a & 1 \leq x < 2 \\ -ax + 3a & 2 \leq x < 3 \\ 0 & \text{else} \end{cases}$$
1. Determine the constant a.
  2. Compute  $P(x \leq 1.5)$

- 9) A radar unit is used to measure the speeds of cars on a motorway. The speeds are normally distributed with a mean of 90 km/hr and a standard deviation of 10 km/hr. Calculate the probability that a car picked at random is traveling at more than 100 km/hr? K4(12)
- 10) Find the probability of getting an even number 3 or 4 or 5 times in throwing a die 10 times K5(10)
- 11) The probability of X, Y, Z became managers are 4/9, 2/9, & 1/3 respectively. The probabilities that the bonus scheme will be introduced if X, Y, and Z becomes managers are 3/10, 1/2, & 4/5 respectively. K5(15)
1. What is the probability that bonus schemes will be introduced.
  2. If the bonus scheme has been introduced, what is the probability that the manager appointed was X?

**OR**

- In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible: K5(15)
- Variance of X = 9.
- Regression equations:
- $$8X - 10Y = -66,$$
- $$40X - 18Y = 214.$$
- What were
- (i) the mean values of X and Y,
  - (ii) the correlation coefficient between X and Y, and
  - (iii) the standard deviation of Y?
- 12) A random variable X has a Binomial distribution B (12, p). K6(12)
1. Given that  $p = 0.25$  find
    - a.  $P(X < 5)$
    - b.  $P(X \geq 7)$
  2. Given that  $P(X=0) = 0.05$ , find the value of  $p$  to 3 decimal places.
  3. Given that the variance of X is 1.92, find the possible values of p.

**OR**

- A sample of 26 bulbs gives a mean life of 990 hours with a S.D of 20 hours. The manufacturer claims that the mean life of bulbs is 1000 hours . Is the sample not upto the standard? K6(12)