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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**Summer Term End Term Examination- August 2024**

**Date**: 07/08/2024

**Time**: 9:30am to 12:30pm

**Max Marks**: 100

**Weightage**: 50%

**Semester**: Summer Term

**Course Code**: MAT1003

**Course Name:** Applied Statistics

**Program:** B.Tech

**Instructions:**

1. *Read all the questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and Non-programmable calculators are permitted.*

**Part A**

**Answer any FIVE questions 5Q x 4M = 20M**

1. Consider the following data set: 10, 12, 5, 9, 8, 4, 8, 6, 7, 2. Identify the median and mean. (CO1) [Knowledge]
2. The intelligence quotients (IQs) of 10 girls in a class are given as 70,120,110,101,88,83,95,98,107,100. Find the mean IQ and median IQ.

(CO1) [Knowledge]

1. Define a) Probability b) Sure Event c) Sample d) Event (CO2) [Knowledge]
2. Three coins are tossed, identify the probability of getting a) all heads, b) exactly one tail or two tails. (CO2) [Knowledge]
3. Define the probability mass function. Also, if 3 coins are tossed simultaneously. Let X be the number of occurrence of tails. Tabulate the probability distribution of X. (CO3) [Knowledge]
4. In a factory, 1 in every 1000 items produced is known to be defective. Identity the probability that a random sample of 8000 will yield lesser than 4 defective items.

(CO3) [Knowledge]

1. Given that X has a normal distribution with a mean of 300 units and variance of 2500 units, find the probability that X assumes a value greater than 362. (Given 𝑃(𝑍 ≤ 1.24) =0.8925)

(CO3) [Knowledge]

**Part B**

**Answer any FIVE questions. 5Q x 10M = 50M**

1. The following data give the 2021 bonuses (in thousands of dollars) of 10 randomly selected Wall Street managers. 127,82,45,99,153,321,77,108,68,278.
   * 1. Estimate variance and standard deviation.
     2. Estimate the coefficient of variance.

(CO1) [Comprehension]

1. Consider the marks given by 2 judges X and Y to 10 participants for a badminton competition on a scale 0-100.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Participant | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Judge X | 50 | 70 | 40 | 60 | 80 | 80 | 80 | 60 | 70 | 90 |
| Judge Y | 50 | 60 | 30 | 30 | 80 | 50 | 70 | 20 | 10 | 30 |

Compute the nature of correlation prevalent between the scores given by the

judges. (CO1) [Comprehension]

1. In a class 60% of the students like mathematics, 35% of students like physics and 25% of students like both math and physics, estimate the probability that.
   * 1. A student likes either Mathematics or Physics.
     2. A student likes physics if it is known that students like mathematics
     3. A student likes mathematics if it is known that students like physics. (CO2) [Comprehension]
2. A consulting firm rents cars from three agencies such that 50% from agency L, 30% from agency M and 20% from agency N. If 10% of the cars from l, 40% of cars from M and 50% of the cars from N are in good conditions. If a car is in good condition, hat is the probability that it has come from
   * 1. agency M b) agency N? (CO2) [Comprehension]
3. It has been observed that 10 drops of water trickle every 5 minutes from a leaking pipe. What is the probability that in 5 minutes (a) exactly 6 drops of water trickle (b) at most 2 drops of water trickle (c) at least 2 drops of water trickle?

(CO3) [Comprehension]

1. The average monthly sales of ‘Reliable Computers’ are 2500 units with a standard deviation of 100 units. The sales are found to be normally distributed over months. What are the chances that the sales during a particular month will be
   * + 1. at most 2400 units
       2. at least 2400 units
       3. between 2450 to 2550 units

(Given that 𝑃(𝑍 ≤ 0.5) = 0.6915, 𝑃(𝑍 ≤ 1) = 0.8413).

(CO3) [Comprehension]

**Part C**

**Answer any TWO questions. 2Q x 15M = 30M**

1. Consider the following data set:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks in Philosophy | 18 | 17 | 23 | 22 | 21 | 20 | 19 | 19 | 20 | 21 |
| Marks in History | 16 | 12 | 20 | 15 | 22 | 15 | 11 | 14 | 19 | 16 |

Apply Linear Regression model to estimate:

* + 1. Marks in philosophy when marks in history is known
    2. Marks in history when marks in philosophy is known.

(CO1) [Application]

1. Police plan to enforce speed limits by using radar traps at 3 different locations within the city limits. The radar traps at each of the locations P, Q and R are operated 40%, 30% and 20% of the time. A person who is speeding on her way to work has probabilities of 0.2, 0.1 and 0.5 respectively, of passing through these locations. If the person received a speeding ticket on her way to work, what is the probability that she passed through the radar trap located at (i) Location P (ii) Location Q (iii) Location R?

(CO2) [Application]

1. It has been observed that during the rainy season, a person reaches his office on time only 4 out of 10 days.
   1. Construct a suitable mathematical model, which represents the number of days out of 𝑛 days, the person reaches his office on time during rainy days.
   2. If it rains consecutively for 5 days, what is the probability that the person reaches his office on time exactly for 4 days?
   3. If it rains consecutively for 5 days, what is the probability that the person reaches his office on time at most for 2 days?
   4. If it rains consecutively for 15 days, what is the expected mean number of days on which he reaches office exactly on time?

(CO3) [Application]