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**Presidency University**

**Bengaluru**

 **SCHOOL OF ENGINEERING**

**MAKE UP EXAMINATION – SEP 2023**

**Date**: 30-SEP-2023

**Time**: 9.30AM – 12.30PM

**Max Marks**: 100

**Weightage**: 50%

**Course Code**: MAT1003

**Course Name**: Applied Statistics

**Program & Sem**: B. Tech & II Sem

**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 [Memory Recall Questions]**

**Answer all the questions. Each question carries TWO marks. (10Q x 2M = 20M)**

1. Consider the marks of 9 students as follows: 5, 6, 9, 10, 3, 7, 2, 5, 4. What is the mean mark? (C.O.No.1) [Knowledge]
2. The coefficient of correlation is found to be 0.87. What is the nature of correlation prevalent between the variables? (C.O.No.1) [Knowledge]
3. What is the probability of scoring a doublet of even numbers while rolling 2 dice?

(C.O.No.2) [Knowledge]

1. For an experiment, the event space of an event A is {1, 3, 5} and that of B is {2, 4}. If A and B are mutually exclusive and exhaustive, what is the sample space?

 (C.O.No.2) [Knowledge]

1. Define the probability mass function of a discrete probability distribution.

 (C.O.No.3) [Knowledge]

1. State any two properties of the standard normal distribution. (C.O.No.3) [Knowledge]
2. What is the level of significance when the level of confidence is 90%?

 (C.O.No.4) [Knowledge]

1. What type of error occurs when one rejects the null hypothesis when it is actually true?

(C.O.No.4) [Knowledge]

1. Distinguish between critical region and acceptance region.

 (C.O.No.4) [Knowledge]

1. For the null hypothesis $H\_{0}:μ=0$, construct a suitable alternative hypothesis.

(C.O.No.4) [Knowledge]

**Part B [Thought Provoking Questions]**

**Answer all the questions. Each question carries TEN marks. (5Q x 10M = 50M)**

1. The following data shows the number of children participating in a drawing competition. Considering the assumed mean age as 5 years, calculate the actual mean age of the participants. (C.O.No.1) [Comprehension]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Age | 0-2 | 2-4 | 4-6 | 6-8 | 8-10 | 10-12 |
| Number of children | 1 | 3 | 5 | 15 | 27 | 35 |

1. A university bought 45%, 25% and 30% of computers from HCL, Wipro and IBM respectively. Suppose that 2% of the computers are from HCL, 3% from Wipro and 1% from IBM are found to be defective. If a randomly chosen computer is found to be defective, what is the probability that it has been manufactured by (a) HCL (b) Wipro.

 (C.O.No.2) [Comprehension]

1. Following is the probability distribution of a discrete random variable X:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|  | 2k | 4k | k | 5k | 3k | 6k | 4k |

Find (a) the value of k (b) $P(X\geq 3)$ (c) $P\left(2\leq X\leq 5\right) \left(d\right) P(X<4)$.

 (C.O.No.3) [Comprehension]

1. The number of people lining up at a ticket counter of a movie theatre in every half an hour is four. What is the probability that within 30 minutes (a) at most 2 people turn up at the counter (b) at least 2 people turn up at the counter (c) not a single person turns up at the counter. (C.O.No.3) [Comprehension]
2. Scores on the GMAT are normally distributed with a mean of 525 and standard deviation of 10. What is the probability that an individual scores (a) at least 500 on the GMAT (b) at most 500 on the GMAT (c) between 522 and 528 on the GMAT.

 (given that $P\left(Z\leq 2.5\right)=0.99479, P\left(Z\leq 0.3\right)=0.99865$). (C.O.No.3) [Comprehension]

**Part C [Problem Solving Questions]**

**Answer all the questions. Each question carries FIFTEEN marks. (2Q x 15M = 30M)**

1. Consider the marks given by 3 judges A, B and C to 5 participants for a singing competition on a scale of 0-10. (C.O.No.1) [Comprehension]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Participants | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Judge A | 5 | 7 | 4 | 6 | 8 | 8 | 8 | 6 | 7 | 9 |
| Judge B | 5 | 6 | 5 | 5 | 8 | 5 | 7 | 2 | 1 | 3 |

 Determine the nature of the correlation prevalent between the scores given by the judges.

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 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? (C.O.No.3) [Comprehension]