B.Tech
6th Semester (*Regular*)
SAS-2022

SPRING MID SEMETER EXAMINATION-2023
Subject: Inferential Statistics
Code: MA-3012

Full Marks: 20 **Time: 1.5 Hrs**

Answer any FOUR QUESTIONS including question No. 1 which is compulsory. The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only

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1. Answer the following questions [5×1=5]

(a) A die is thrown 5 times. Find the probability of getting at least one "six".

(b) If the random variable X has expectation $E(X) = 2$ and variance $V(X) = 1$, obtain the mean and variance of $Y = 4X - 3$.

(c) The probability that an individual is left-handed is 0.16. In a class of 10 students, what is the standard deviation of the number of left-handed students?

(d) If probability density function of the random variable X is

$$f(x) = \begin{cases} kx(1-x), & 0 \le x \le 1 \\ 0, & otherwise \end{cases},$$

then find the value of k.

(e) Find the mean of exponential distributions.

2. Let there be two identical bags. Bag 1 contains 5 white and 3 black balls. Whether, Bag 2 contains 4 white and 6 black balls. A bag is selected at random and 2 balls are drawn, each found to be white. Find the probability that Bag 1 was selected. **[5]**

3. The probability mass function of a random variable X is zero except at the points $x = 0, 1, 2$. At these points it has the values $p(0) = 3k^3$, $p(1) = 4k - 10k^2$ and $p(2) = 5k - 1$ for some $k > 0$.
(i) Determine the value of k.
(ii) Compute the probability $P(1 < X \le 2)$.
(iii) Find the largest x such that $F(x)$ <1/2.
[5]

4. Suppose that only 10% of all computers of a certain type experience CPU failure during the warranty period. Consider a sample of $10,000$ computers.
(i) What are the expected value and standard deviation of the number of computers in the sample that have the defect?
(ii) What is the (approximate) probability that no sampled computer has the defect? **[5]**

5. The marks obtained by a number of students for a certain subject are assumed to be approximately normally distributed with mean value 65 and with a standard deviation of 5. If 3 students are taken at random from this set what is the probability that exactly 2 of them will have marks over 70? $[\Phi(1) = 0.8413]$ **[5]**

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