Roll No												

PRESIDENCY UNIVERSITY
BENGALURU

SCHOOL OF INFORMATION SCIENCE

MAKE UP EXAMINATION – JAN 2023

Course Code: MAT1008

Course Name: Probability and Inferential Statistics

Program: BSc Data Science

Date: 20-JAN-2023

Time: 01.00 PM to 04.00 PM

Max Marks: 100

Weightage: 50%

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Question paper consists of 3 parts.
(iii) Scientific calculator and distribution tables are permitted.

Part A [Memory Recall Questions]

Answer all the questions. Each question carries FIVE marks. (6Q x 5M = 30M)

1. What is the probability of getting a total of 11 or 12 when a pair of fair dice is rolled? (C.O.No.1) [Knowledge]

2. The probability that an American industry will locate in Shanghai, China, is 0.7, the probability that it will locate in Beijing, China is 0.4, and the probability that it will locate in either Shanghai or Beijing or both is 0.8. What is the probability that the industry will locate in both cities? (C.O.No.1) [Knowledge]

3. A fuse box contains 20 fuses, of which 5 are defective. If 2 fuses are selected at random and removed from the box in succession without replacing the first, what is the probability that both fuses are defective? (C.O.No.1) [Knowledge]

4. State any five properties of the normal probability distribution. (C.O.No.3) [Knowledge]

5. Distinguish between (a) parameters and statistics (b) type I and type II errors. (C.O.No.4) [Knowledge]

6. Briefly explain the terms (a) null hypothesis (b) level of significance. (C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries EIGHT marks. (5Q x 8M = 40M)

7. For married couples living in a certain suburb, the probability that the husband will vote on a bond referendum is 0.21, the probability that the wife will vote on the referendum is 0.28, and the probability that both will vote is 0.15. What is the probability that (a) at least one member of a married couple will vote? (b) a wife will vote, given that her husband will vote? (C.O.No.1) [Comprehension]

8. A university bought 45%, 25% and 30% of computers from HCL, Wipro and IBM respectively. Suppose that 2% of the computers from HCL, 3% of the computers from Wipro and 1% of the computers from IBM are found to be defective. (a) Find the probability that a computer selected at random is defective (b) Given a randomly chosen computer is defective, what is the probability that it is made by Wipro? (C.O.No.1) [Comprehension]

9. A shipment of 7 television sets contains 2 defective sets. A hotel makes a random purchase of 3 of the sets. If *X* is the number of defective sets purchased by the hotel, find the probability distribution and the cumulative distribution function of the random variable *X*.
(C.O.No.2 [Comprehension]

10. The probability that a patient recovers from a rare blood disease is 0.4. If 15 people are known to have contracted the disease, what is the probability that (a) at least 10 survive (b) from 3 to 8 survive and (c) exactly 5 survive? (C.O.No.3) [Comprehension]

11. (a) The probability that a student pilot passes the written test for a private pilot's license is 0.7. Find the probability that a given student will pass the test on the third try.

(b) Suppose the time it takes a nine-year old child to eat a donut follows a continuous uniform distribution between 0.5 and 4 minutes. Find the probability that a randomly selected nine-year old child eats a donut in at least 2 minutes. (C.O.No.3) [Comprehension]

Part C [Problem Solving Questions]

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

12. (a) Following is the probability distribution of a discrete random variable X

x	0	1	2	3	4	5	6
$f(x)$	k	3k	5k	7k	9k	11k	13k

Find (i) the value of k (ii) $P(X \geq 5)$ (iii) $P(3 < X \leq 6)$.

(b) The probability density function of a continuous random variable *X* is given by

$$f(x) = \begin{cases} k\left(1-x^2\right) & \text{for } 0 \leq x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

Find (i) the value of *k* (ii) $P(0.1 \leq X \leq 0.2)$ (iii) $P(X \geq 0.5)$. (C.O.No.2) [Comprehension]

13. (a) It is known that 2% of the fuses manufactured by a firm are defective. Using the Poisson distribution, find the probability that a box containing 200 fuses has (a) no defective fuses (b) 3 or more defective fuses.

(b) An electrical firm manufactures light bulbs that have a life, before burn-out, that is normally distributed with mean equal to 800 hours and a standard deviation of 40 hours. Find the probability that a bulb burns between 778 and 834 hours.
(C.O.No.3) [Comprehension]