Reg. No ..... Name **23U366**

B. Sc. DEGREE END SEMESTER EXAMINATION: NOVEMBER 2023

SEMESTER 3: STATISTICS (FOR PSYCHOLOGY)

COURSE: 19U3CPSTP03: STATISTICAL METHODS AND ELEMENTARY PROBABILITY

(For Regular 2022 Admission and Improvement / Supplementary 2021/2020 Admissions)

Time: Three Hours Max. Marks: 75

PART-A

Answer all questions, in not more than two/three sentences.
Each question carries 1 mark.

1. If A and B are two independent events which can happen in m ways and n ways respectively then both of them together can happen in …… number of ways.
2. …… is called the impossible event and the probability of its occurrence is …….
3. The probability of having 2 officers in a committee of 5 when the committee is selected from 10 officers and 6 Managers is …….
4. If A and B are two ……events, then $P(A \cap B) = P(A)\,P(B)$
5. …… is an example of continuous random variable.
6. The probability density function of a random variable X is given by $f(x) = ax$, $x = 0,1,2$. Then the value of a is …….
7. The mathematical expectation of the number of heads when three coins are tossed at a time is …….
8. The variance of a Binomial distribution with mean of 16 and $p = 0.7$ is ……
9. The median and standard deviation (SD) of a normal distribution are 1000 and 300 respectively, The probability that a randomly selected observation is in the interval Mean + SD is ……
10. The shape of the curve of normal distribution is ……

(1 x 10 = 10)

PART- B

Answer any Eight of the following questions in three/four sentences.
Each question carries 2 marks.

11. Define mutually exclusive events.
12. A coin is tossed and the face turning up is observed. If the face turning up is head, a die is tossed. Write down the sample space.
13. A speak the truth with a probability of 0.8 and B speak the truth with a probability of 0.6. What is the probability that both of them speak the truth?
14. Define conditional probability
15. What is the probability of having exactly 52 Sundays in a randomly selected year?
16. State the Baye's Theorem.
17. Define a random variable.
18. Write down the probability density function of a random variable following binomial distribution with mean 4 and standard deviation 3.

19. Define standard normal distribution.
20. What is the area under standard normal curve between 1 and 2.5?

(2 x 8 = 16)

PART- C

Answer any Five of the following questions in a paragraph. Each question carries 5 marks

21. Briefly explain the statistical and axiomatic approaches to probability.
22. State and prove the addition theorem of probability for two events.
23. A problem in mathematics was given to three students. The probability they can solve the problem are in the ratio 2 : 3 :5. Find the probability that a problem given to them is (a) not solved (b) solved (c) solved by all of them.
24. Find the mathematical expectation of the sum of numbers when two dice are thrown at a time.
25. A random variable X which follows binomial distribution has mean 3 and variance 2. Find (a) P (X < 3) (b) P(X > 1)
26. The probability of success for a binomial distribution is thrice that of failure. In 12 repetitions of the experiment, what is the probability of getting
    (a) 3 successes (b) not less than 11 successes
27. Life of electric bulbs follows a normal distribution with mean 3000 hours and standard deviation 700 hours. Find the probability that life of a randomly selected bulb is between 2000 and 4500.

(5 x 5 = 25)

PART-D

Answer any Two of the following questions in essay form in about 300 words.
Each question carries 12 marks.

28. (a) If A is a subset of B, prove that $P(A \cap B) < P(A) < P(B) < P(A \cup B) < P(A) + P(B)$
    (b) There are three boxes B1, B2 and B3. The contents in the boxes are given below.
    Box B1 - 5 Red, 8 Blue and 6 White balls.
    Box B2 - 7 Red, 9 Blue and 3 White balls.
    Box B3 - 8 Red, 8 Blue and 5 White balls.
    What is the probability that a ball drawn from a randomly selected box is white?
29. The probability density function of a discrete random variable is given below

X:	0	1	2	3	4	5
f(x):	k	4k	8k	17k	9k	4k

    Find the mean and variance
30. What are the properties of normal distribution?
31. The Aptitude score of students follow a normal distribution with mean score of 240 and standard deviation (SD) of 60. What is the probability that Aptitude score score of a randomly selected student is
    Between 200 and 300.
    More than 400.
    Less than 360.
    Between mean + 2 SD

(12 x 2 = 24)