

MCA 1<sup>st</sup> Sem -2019

Time: 3 Hours

Full Mark: 70

(Answer all questions. Figures in the right hand margin indicates marks)

Q1.

a) A die is loaded in such a way that the probability with the face with  $j$  dots turning up is proportional to ' $j$ ' for  $j=1, 2, 3, \dots, 6$ . What is the probability in one roll of the die that the odd no of dots will turn up?

[6]

b) i) A school has 370 students. What is the probability of at least two students have same birthday. (Using Pigeonhole principle).

[4]

ii) Are two independent events mutually Exclusive? Prove your answer.

[4]

OR

a) State and prove Bayes Theorem.

[6]

b) i) The probability of scoring a century for Virat Kohli and Rohit Sharma is 0.3 and 0.4 respectively. Given that Rohit Sharma scoring a century, the probability of Virat Kohli scoring a century is 0.2. Find the probability of both scoring a century.

[4]

ii) X, Y, Z are three swimmers competing in Olympics swimming. Probability of X to win the competition is twice of Y and probability of Y is twice that of Z. What are the probabilities of X, Y and Z to win? What is the Probability of Y to loose?

[4]

Q2.

a) What is binomial distribution? Mathematically derive the formula for Binomial distribution. [8]

b) No of international seminars held in an institution in a year has a mean value of 2. What is the probability that exactly 3 international events will be held in next two years? [6]

OR

a) Derive the Mean and variance of Poisson distribution. [8]

b) On a Five questions multiple choice test, there are 5 possible answers, of which one is correct. If a student guesses randomly and independently what is the probability that he is correct on three questions. [6]

Q3.

a) State and explain **Central Limit Theorem** with examples and diagrams. [8]

b) The duration of Alzheimer's disease from the onset of symptoms until death ranges from 3 to 20 years; the average is 8 years with a standard deviation of 4 years. The

Administrator of a large medical centre randomly selects the medical records of 30 deceased Alzheimer's patients from the medical centre's database, and records the average duration. Find the approximate probabilities for these events [6]

- i) the average duration is less than 7 years.
- ii) the average duration exceeds 7 years.

OR

a) Explain the terms : Samples and population, sampling distribution, confidence interval. [8]

b) A random sample of 985 "likely" voters—those who are likely to vote in the upcoming election—were polled during a phone-athon conducted by the Republican Party. Of those surveyed, 592 indicated that they intended to vote for the Republican candidate in the upcoming election. Construct a 90% confidence interval for  $p$ , the proportion of likely voters in the population who intend to vote for the Republican candidate. Based on this information, can you conclude that the candidate will win the election? [6]

Q4.

a) Define Null and Alternative hypothesis with examples. Explain the parts of statistical test of Hypothesis. [8]

b) The average weekly earnings for female social workers is \$670. Do men in the same Positions have average weekly earnings that are higher than those for women? A random sample of  $n = 40$  male social workers showed  $\bar{x} = \$725$  and  $s = \$102$ . Test the appropriate hypothesis using  $\alpha = 0.01$ . [6]

OR

How a paired t test is different from t test ? What is a Chi-square test? What is a F test ? [14]

Q5 Explain Design of experiment with explanation of important terms. [14]  
What is one-way ANOVA.

OR

a) What is Linear Regression? Explain Principle behind finding the best fit relation using least square method? [8]

b) Professor Isaac Asimov was one of the most prolific writers of all time. Prior to his death, he wrote nearly 500 books during a 40-year career. In fact, as his career progressed, he became even more productive in terms of the number of books written within a given period of time. The data give the time in months required to write his books in increments of 100:

Number of Books, $x$	100	200	300	400	490
Time in Months, $y$	237	350	419	465	507.

Assume that the number of books  $x$  and the time in months  $y$  are linearly related. Find the least-squares line relating  $y$  to  $x$ . [6]