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Total No. of Pages : 02

Total No. of Questions : 07

M.Sc. (Mathematics) (Sem.-3) MATHEMATICAL STATISTICS Subject Code : MSM-303-18 M.Code : 76674 Date of Examination : 19-12-22

Time: 3 Hrs.

Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

- 1. SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.
- 2. SECTION B & C. have THREE questions each.
- 3. Attempt any FOUR questions from SECTION B & C carrying FIFTEEN marks each.
- 4. Select atleast TWO questions from SECTION B & C each.

SECTION-A

l. Write short notes on :

- a) What is the probability that a rectangle chosen on chessboard is a square.
- b) State Chebychev's inequality.
- c) Two random variables X and Y are independent. Show that E(XY) = E(X) E(Y).
- d) What do you mean by level of significance and critical region?
- e) Find the mean and the standard deviation of the following function:

$$f(x) = Ce^{\frac{-1}{24}(x^2 - 6x = 9)} - \infty \le x \le \infty, c \text{ being a constant.}$$

SECTION-B

2. a) A and B are two independent events. The probability that both A and B occur is $\frac{1}{6}$ and the probability that neither of them occurs is $\frac{1}{3}$. What is the probability of occurrence of either of the event?

- b) State and Prove Bayes' theorem.
- 3. Two dice are rolled. Let X denote the random variable which counts the total number of points on the upturned faces, Construct a table giving the non-zero values of the probability mass function and draw the probability chart. Also find the distribution function of X.
- 4. Let X and Y be jointly distributed with p.d.f. as given below:

$$f_{xy}(x, y) = \begin{cases} \frac{1}{4}(1 + xy), & |x| < 1, |y| < 1 \\ 0 & otherwise \end{cases}$$

- a) Show that X and Y are not independent but X^2 and Y^2 are independent.
- b) Find the marginal density function of X.
- c) Find the marginal density function of Y.

SECTION-C

- 5. Show that Poisson distribution is a limiting case of Binomial distribution when n is very large and p is small such that np is fixed. Also, using Poisson distribution, find the chance that there will be less than three accidents in a day if 10 accidents took place in a span of 50 days in a town.
- 6. Find the moment generating function and distribution function of the exponential distribution.
- 7. The following data represents the biological values of protein from cow's milk and Buffalo's milk:

Cow's Milk	1.82	2.02	1.88	1.61	1.81	1.54
Buffalo's Milk	2.0	1.83	1.86	2.03	2.19	1.88

Examine whether the average values of protein in the two samples significantly differ at 5% level. $[t_{0.05} = 2.23 \text{ for } 10d.f.]$

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.