[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5041 **H**

Unique Paper Code : 2362201202

Name of the Paper : DSC – Statistics

Name of the Course : **NEP-UGCF-2022 – B.A. (Program) OR**

Semester : II

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. **All** questions carry equal marks.

1. (a) Define probability function. Show that probability function defined on probability space is sub-additive. (8)

   (b) Define Conditional Probability. If A and B are two events such that $P(A) > 0$ and $P(B) \neq 0$, then prove that (10)

P.T.O.

$$P\left(A^c \middle| B^c\right) = \frac{1 - P(A \cup B)}{P\left(B^c\right)}$$

2. (a) What are pairwise Independent events. Give example. (8)

(b) In a bolt factory, machines A, B and C manufacture 40%, 30% and 30% of the total outputs respectively. Of their total outputs, 1%, 5% and 10% are defective bolts. A bolt is chosen at random from factory's production and is found to be defective. What is the probability that it was manufactured by machine C? (10)

3. (a) A Random Variable X has the following probability mass function :

X	0	1	2	3	4	5	6	7
p(x)	0	K	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

(i) Find 'k'

(ii) Evaluate P (X < 4). (10)

(b) Let two Random Variables X and Y have joint pdf given by :

$$f(x,y) = cxy \qquad 0 < x < 1, \quad 0 < y < 2.$$

Find the value of c. (8)

4. (a) For the following bivariate probability distribution of X and Y, find

(i) $P(X \leq 0)$

(ii) $P(X \leq 0, Y = 2)$

(iii) $P(X < 0, Y < 1)$ (10)

X \ Y	0	1	2
-1	1/20	3/20	3/20
0	2/20	3/20	2/20
1	3/20	1/20	2/20

(b) An experiment consists of three independent tosses of a fair coin. Let X = the number of heads.

Find the probability mass function of X. Also find the expectation of X. (8)

5. (a) The mean and variance of the binomial distribution are 4 and 4/3 respectively. Find $P(X \geq 1)$. (8)

(b) Define continuous uniform distribution. If a random variable X is uniformly distributed with mean 2 and variance 4/3. Find $P(X < 0)$. (10)

6. (a) If one shop in 1000 has a fire in a city every year. What is the probability that out of 2000 shops exactly 5 shops will be on fire during the year? (8)

(b) Two fair dice are tossed 600 times. Let X denotes the number of times a total of 7 occurs. Use Central Limit Theorem to find $P(95 \leq X \leq 115)$. (10)

7. (a) Calculate the correlation coefficient for a dataset with the following values of X and Y : (8)

X	1	3	4	5	7	8	10
Y	2	6	8	10	14	16	20

(b) Define Line of regression. Let the lines of regression be $3x + 12y - 19 = 0$ and $9x + 3y - 46 = 0$, then find the coefficient of correlation between X and Y. (10)