LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

SECOND SEMESTER – **APRIL 2023**

16/17/18UST2MC02 – DISCRETE DISTRIBUTIONS

Date: 13-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

Section A:

Answer **ALL** the questions: (10 X 2 = 20)

1 Define the marginal distribution

2 When do we say that the two random variables X and Y are stochastically independent?

3 In a binomial distribution consisting of 5 independent trials, probabilities of 1 and 2 successes are 0.4096 and 0.2048 are respectively. Find the parameter 'p' of the distribution.

4 Define discrete uniform distribution.

5 Write any 4 examples for Poisson distribution.

6 Mark the recurrence formula for moments of Binomial distribution.

7 State any two properties of the negative binomial distribution.

8 Characterize Geometric distribution.

9 Describe multinomial distribution.

10 Under what conditions the hyper geometric distribution tends to binomial distribution?

Section B:

Answer **ANY FIVE** questions: (5 X 8 = 40)

11 The joint probability distribution of two random variables X and Y is given by

$P(X = 0 , Y =1) = 1/3$, $P (X =1 , Y = -1) = 1/3$ and $p(X=1,Y=1) = 1/3$

find (i) marginal distributions of X and Y

(ii) $P(X=1/Y=1)$

(iii) $E[X]$

(iv) $E[X/Y=1]$

12 If X and Y are independent, then Prove that

(i) $E[E(X/Y)] = E(X)$ and (ii) $E(X/Y) = E(X)$

13 Derive the MGF of binomial distribution. Hence find Mean and Variance.

14 A car hire firm has two cars, which it hires out day by day. The number of demands for a car on each day is distributed as a Poisson distribution with mean 15. Calculate the proportion of days on which (i) neither car is used and (ii) the proportion of days on which some demand is refused.

15 Explain memoryless property of Geometric distribution.

16 Prove that the sum of independent Poisson variates is also a Poisson variate.

17 Obtain the moments of multinomial distribution.

18 Let X_1 , X_2 be independent random variables each having geometric distribution , $q^k p$, k=0,1,2,…… show that the conditional distribution of X_1 given X_1+X_2 is uniform.

Section C:

Answer ANY TWO questions: (2 X 20 = 40)

19 The joint probability distribution of X and Y is given below : 20

X / Y	-1	+1
0	1/8	3/5
1	2/8	2/8

Find the (i) E(X) and E (Y) (ii) E(XY) (iii) Covariance of X,Y (iv) the correlation between X and Y.

20 a) Obtain the density function of a Poisson distribution as a limiting case of Binomial distribution. 10

b) Obtain MGF of Negative Binomial distribution and hence obtain its mean and variance 10

21a) Suppose that the number of telephone calls coming into a telephone exchange between 10 am and 11 am, say, X_1 is a random variable with Poisson distribution with parameter 2. Similarly the number of calls arriving between 11 am and 12 noon, say, X_2 has a Poisson distribution with parameter 6. If X_1 and X_2 are independent, what is the probability that more than 5 calls come in between 10 am and 12 noon? 10

b) Obtain binomial distribution as a limiting case of hyper geometric distribution.

22 a) Derive the mean and variance of Hyper geometric distribution 10

Let X be a discrete random variable having geometric distribution with 10

b) parameter p, obtain its mean and variance through M.G.F.

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