LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIRST SEMESTER – **NOVEMBER 2019**

UST 1502 – PROBABILITY AND DISCRETE DISTRIBUTIONS

Date: 01-11-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Section A

Answer ALL the questions **(10X2=20)**

1. Define equally likely events.
2. What is the range of probability?
3. Define conditional probability.
4. When are two events said to be independent?
5. Define probability mass function.
6. State the properties of distribution function.
7. Write the formula of covariance.
8. Define mathematical expectation.
9. Define negative Binomial distribution.
10. Write the mean and variance of geometric distribution.

Section B

Answer any FIVE of the following **(5X8=40)**

11. A, B and C are three mutually exclusive and exhaustive events associated with a random experiment. Find P(A) given that P(B) = $\frac{3}{2}$P(A) and P(C) = $\frac{1}{2}$P(B).
12. State and prove multiplication theorem of probability.
13. A bag contains 17 counters marked with the numbers 1 to 17. A counter is drawn and replaced. A second drawing is then made. What is the probability that
    i. The first number drawn is even and the second odd?
    ii. The first number drawn is odd and the second even?
14. State and prove addition theorem of expectation.
15. Find the mean and variance of Poisson distribution using moments.
16. The joint probability mass function of a two dimensional random variable (X,Y) is.

X \ Y	-1	0	1
-1	0	1/ 12	1/ 6
0	1 / 6	1 / 6	1/ 12
1	1/12	1/6	1/12

i. Find the marginal distribution of X and Y.
ii. Check the independence of X and Y.

17. Four cards are drawn at random from a pack of 52 cards. Find the probability that

    i. They are a King, a queen, a jack, and an ace.

    ii. Two are black and two are red

    iii. Two cards are hearts and two cards of diamonds.

18. Prove that geometric distribution lacks memory.

Section C

Answer any TWO of the following **(2X20=40)**

19. a) if two dice are thrown, what is the probability that the sum is (i). Greater than 8 and (ii). neither 7 nor 11?

    b) State and prove Baye's theorem.

20. a) the joint probability distribution of two random variables X and Y is given by $P(X=0,Y=1)=\frac{1}{3}$,

    $P(X=1,Y=-1)=\frac{1}{3}$ and $P(X=1,Y=1)=\frac{1}{3}$

    Find (i). Marginal distributions of X and Y.

    (ii). The conditional probability distribution of X given Y=1.

    b) Derive the MGF of Binomial distribution. Hence obtain the mean and variance.

21. a) State and prove any two properties of M.G.F.

    b) Let the random variable X assume the value 'r' with the probability law. $P(x=r)=q^{r-1}p$, $r=1,2,3,...$

    Find the M.G.F. of X.

22. a) Ten coins are thrown simultaneously. Find the probability of getting at least seven heads.

    b) Derive the mean and variance of Hypergeometric distribution.

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