LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SECONDSEMESTER – APRIL 2017

16UST2MC02- DISCRETE DISTRIBUTIONS

Date: 25-04-2017 Dept. No. Max. : 100 Marks
01:00-04:00

PART A

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

1. What is meant by conditional distribution of Y given $X = x$?
2. Explain stochastic independence.
3. Define MGF of a random variable X.
4. Comment on the following: "the mean of a binomial distribution is 3 and variance is 4".
5. List any four instances where Poisson distribution may be successfully employed.
6. If X is a Poisson variatewith $E(X^2) = 6$, find $E(X)$?
7. State the conditions under which negative binomial distribution tends to Poisson distribution.
8. Define Geometric distribution.
9. Write the expression for mean and variance of hypergeometric distribution.
10. What is meant by multinomial distribution?

PART B

Answer any **FIVE** questions: **(5X8=40 marks)**

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

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

    (i). Find the marginal distribution of X and Y.

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

    (iii). The conditional probability distribution of Y given $X = 1$.
12. Derive the recurrence relation for the moments of binomial distribution. Hence find mean and variance.
13. If $X \sim P(\lambda)$ and $Y \sim P(\mu)$ are independent Poisson variables such that $P(X = 1) = P(X = 2)$ and $P(Y = 2) = P(Y = 3)$. Find the variance of $X - 2Y$.
14. Derive the MGF of negative binomial distribution.
15. Derive the mean and variance of geometric distribution.
16. Show that binomial distribution is a limiting form of hypergeometric distribution.

17. Derive MGF and CGF of Poisson distribution and hence find its mean and variance.
18. Derive mean deviation about mean of the binomial distribution.

PART C

Answer any **TWO** questions:**(2X20=40 marks)**

19. Let X and Y be two random variables each taking three values -1, 0 and 1 respectively. Having the joint probability distribution

Y \ X	-1	0	1
-1	0	0.1	0.1
0	0.2	0.2	0.2
1	0	0.1	0.1

(i). Show that X and Y have different expectations.
(ii). Prove that X and Y are uncorrelated.
(iii). Find variance of X and Y.
(iv). Given $Y = 0$, what is the conditional probability distribution of X.
(v). Find $Var(Y \mid X = -1)$.

20. (i). Obtain the MGF of binomial distribution with parameters n and p. Hence find mean and variance. **(12)**
(ii). A coffee connoisseur claims that he can distinguish between a cup of instant coffee and a cup of percolator coffee 75% of the time. It is agreed that his claim will be accepted if he correctly identifies atleast 5 out of 6 cups. Find his chance of having the claim (a) accepted, (b) rejected when he does have the ability he claims. **(8)**
21. (i). Show that Poisson distribution as a limiting form of a binomial distribution. **(10)**
(ii). Obtain cumulants of Poisson distribution and hence find its mean and variance. **(10)**
22. (i). State and prove lack of memory property of geometric distribution. **(10)**
(ii). Derive MGF of multinomial distribution. **(10)**

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