# LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – STATISTICS

FOURTH SEMESTER – APRIL 2010

**ST 4502/ST 4501 - DISTRIBUTION THEORY**

Date & Time: 21/04/2010 / 9:00 - 12:00 Dept. No. Max. : 100 Marks

**PART – A**

Answer ***ALL*** Questions (10 x 2 = 20 marks)

1. Show that f(x,y) = 8xy, $0<x<y<1$ is a joint probability density function (pdf) of a two dimensional R.V. (X,Y).
2. For a two dimensional continuous R.V. (X,Y), define the marginal probability density function (pdf) of X and the conditional pdf of Y given X.
3. Give the density function of the Hypergeometric distribution.
4. Obtain the moment generating function of the geometric distribution and hence find its mean.
5. State any two properties of the bivariate normal distribution.
6. Find the mean of the Beta distribution of the first kind with parameters $\alpha$ and $\beta$.
7. Obtain the pdf of Y = 2X + 1, where X has pdf f(x)= 1/3, x=1,2,3 and 0 elsewhere.
8. Write down the t-statistic.
9. Find the cumulative distribution function of the largest order statistic of i.i.d. R.V's of the continuous type and hence find its pdf.
10. Define the limiting distribution of a random variable.

**PART – B**

Answer any ***FIVE*** Questions (5 x 8 = 40 marks)

11. Let f(x,y) = 2, $0<x<y<1$ be the joint pdf of (X,Y). Obtain the conditional pdf, and hence the conditional mean and variance of X given Y.
12. Show that Poisson distribution is a limiting case of the Binomial distribution. Also state and prove the reproductive property of the Poisson distribution.
13. Find the mean and variance of the double exponential distribution.
14. Obtain the distribution of the random variable $X^2$, where X ~ N(0,1).
15. State and prove the "Memory less property" of the exponential distribution.
16. Obtain the marginal distribution of Y if (X,Y) follows a bivariate normal distribution.
17. Show that $X_{(1)}$ follows exponential distribution with parameter n$\lambda$ if $X_i$ s are i.i.d. exponential with parameter $\lambda$.
18. Write a note on (a) multinomial probability distribution (b) stochastic convergence. **(P.T.O)**

## PART – C

Answer any ***TWO*** Questions (2 x 20 = 40 marks)

19. State and prove the classical central limit theorem.
20. Obtain the distribution of the sample mean and sample variance from a normal population and show that they are independently distributed.
21. Derive the probability density function of Snedecor's F distribution.
22. Let $f(x,y) = (1+xy)/4$, $|x|<1$ & $|y|<1$, be the joint pdf of (X,Y). Show that X and Y are not independent but $X^2$ and $Y^2$ are independent.

$$$$$$$