DON BOSCO ARTS AND SCIENCE COLLEGE LIBRARY ANGADIKADAVU

Reg. No. : ....

Name : ....

M 8786

Third Semester B.Sc. Degree Examination, November 2010
STATISTICS (Complementary)
3C03 STA : Standard Distributions (Course No. – 3)

Time: 3 Hours ; Total Weightage : 30

Instruction : Use of calculators and statistical tables permitted.

PART – A

Answer **any 10** questions (Weightage **1 each**) : **(10×1=10)**

1. Define expectation of a random variable.
2. A balanced die is thrown. Find the expected value of the number shown by the die.
3. Define characteristic function. What is the advantage of characteristic function over moment generating function ?
4. Express the fourth central moment in terms of fourth and lower order raw moments.
5. Two random variables X and Y have the following joint density function :

   $$f(x, y) = \begin{cases} 2 & \text{if } 0 < x < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

   Find the conditional mean of X given Y = y.
6. Find the mean of the Poisson distribution with parameter λ.
7. Find the moment generating function of geometric distribution.
8. Establish the additive property of two independent normal random variables.
9. If X and Y are independent and identically distributed exponential random variables, find the distribution of X + Y.

P.T.O.

10. Define convergence in probability.

11. State the central limit theorem for independent and identically distributed random variables.

PART – B

Answer **any 6** questions (Weightage **2 each**) : **(6×2=12)**

12. If X and Y are two independent random variables, show that the correlation coefficient between X and Y is zero. Illustrate using an example that the converse is not true in general.

13. A random variable X has the following probability density function :

$$f(x)=\frac{1}{2}e^{-|x|};\ -\infty < x < \infty$$

Find the moment generating function.

14. If the first four raw moments of a random variable are 1, 2, 3 and 4 respectively, find the values of the first four central moments.

15. Derive the moment generating function of Poisson distribution. Hence, find its variance and the third central moment.

16. If X and Y are independent geometric random variables with a common parameter, show that the conditional distribution of X given X + Y is discrete uniform.

17. For a normal distribution, find the mean deviation, deviation about mean.

18. Define one parameter gamma distribution. Obtain its moment generating function and hence find the mean and variance.

19. State and prove Chebychev's inequality.

20. State and prove Bernoulli law of large numbers.

PART – C

Answer **any two** questions (Weightage **4 each**) : **(4×2=8)**

21. The joint density function of two random variables X and Y is

$$f(x, y) = \begin{cases} 2 & \text{if } 0 < x < y < 1 \\ 0 & \text{otherwise} \end{cases}$$

Find the correlation coefficient between X and Y.

22. Derive the recurrence relation for the central moments of binomial distribution. Hence find its first three central moments.

23. Discuss the important properties of normal distribution. What are its important applications ?

24. Let X be a geometric random variable with mass function

$f(x) = \left(\frac{1}{2}\right)^x; \; x = 1, 2, 3, \ldots$

Show that the Chebychev's inequality gives

$P\{|X-2| \le 2\} > \frac{1}{2}$

Find the actual probability.