B.Sc. Statistics, First Year DEGREE EXAMINATION, DECEMBER 2006

Paper I - PROBABILITY AND DISTRIBUTIONS

Time : Three hours | Maximum : 100 marks

Answer any FOUR from Section A and all questions in Section B.

SECTION A - (4 X 20 = 80 marks)

1. (a) Obtain the limits for Bowley's co-efficient of skewness. Describe the importance of co-efficient of skewness.

(b) Explain the concept of Kurtosis. Distinguish between positive and negative and negative skewness.

2. (a) Show that for 'n' attributes

$A_1, A_2, A_3 \ldots A_n (A_1 A_2 A_3 \ldots A_n) \geq (A_1) + (A_2) + (A_3) + \ldots + (A_n) - (n-1)N$. Where N is the total number of observations.

(b) Three Urns have the composition of white and black chips are Urn I : 6 white, 4 black, Urn II : 3 white, 7 black, Urn III : 1 white, 9 black. A Urn is chosen at random and a chip is drawn from it. The chip is white. What is the probability that it is from Urn II?

3. (a) State and prove Chebychev's Inequality.

(b) A continous random variable 'X' has the following probability law:

$$f(x) = \begin{cases} Ax^2 ; & 0 \leq x \leq 1 \\ 0 & ; \text{other wise} \end{cases}$$

Determine

(i) A

(ii) Mean and

(iii) $P(0.1 \leq X \leq 10.5)$.

4. (a) The length (in hours) X of a certain type of light bulbs may be supposed to be a continuous random variable with probability density function.

$$f(x) = \begin{cases} a / x^3 ; & 1500 < x < 2500 \\ 0 & ; \text{elsewhere.} \end{cases}$$

Then determine the constant 'a' and compute the probability of the event $1700 \leq x \leq 1900$.

(b) The mileage 'X' in thousands of miles, which car owners get with a certain type of tyre is a variate with probability density function:

$$f(x) = \begin{cases} k e^{-x/20} ; & \text{for } x \geq 0 \\ 0 & ; \text{otherwise.} \end{cases}$$

Determine k and find the probability that one of these tyres will last atleast 3000 miles.

5. (a) Deduce the moments of Negative Binomial from those of Binomial Distribution.

(b) Derive the probability generating function of the Binomial Distribution and find its mean and variance from it.

6. (a) State and prove the Additive Property for independent Poisson variates. Is the converge also true?

(b) Show that Exponential Distribution has 'lack of memory' property.

7. (a) Define the Beta distribution of the second kind. Find its mean and variance.

(b) Define a two parameter Gamma distribution. Verify whether this distribution processes the additive property for independent Gamma variates.

8. (a) What is a Hypergeometric distribution? Find the mean and variance of this distribution.

(b) Obtain Ithe recurrence relation for the moments of normal distribution.

SECTION B - (10 X 2 = 20 marks)

9. (a) Define a 'Moment'. What is its use?

(b) What do you understand by consistency of data?

(c) State the Baye's theorem.

(d) Explain events and mutually exclusive events.

(e) State central limit theorem.

(f) Define probability mass function.

(g) Cauchy - Schwartz inequality.

(h) Explain importance of normal distribution.

(i) Define rectangular distribution in the internal (a,b).

(j) Give the additive property of Cauchy distribution.