(b) What is compound distribution ? Give a practical situation where we come across compound binomial distribution. 8+8

OR

(B) (i) Derive p.d.f. of normal distribution truncated at $x = a$, find its mean.

(ii) Obtain mean of truncated Poisson distribution truncated at origin. 8+8

AQ – 831

First Semester M.A./M.Sc. – I Examination

STATISTICS

(Elementary Probability and Distribution Theory)

Paper – I (1 SCA 1)

P. Pages : 4

Time : Three Hours] [Max. Marks : 80

1. (A) (a) Prove that

$$P\left(\bigcap_{i=1}^{n} Ai\right) \geq \sum_{i=1}^{n} P(Ai) - (n-1)$$

$$P\left(\bigcup_{i=1}^{n} Ai\right) \leq \sum_{i=1}^{n} P(Ai)$$

(b) State and prove linearity property of expectation of random variable. 8+8

OR

(B) (i) Explain the concepts.

(a) Random variable.

(b) Independence of random variable

(c) Marginal and conditional probability.

(ii) Define probability of an event under classical and axiomatic approach. Also define conditional probability and show that conditional probability follows all the axioms of probability. 6+10

2. (A) (a) Derive expression for M.G.F. of Binomial distribution.

(b) Obtain recurrence relation for the moments of binomial distribution. 8+8

OR

(B) (i) Define geometric distribution. Obtain its moment generating function and hence find mean and variance.

(ii) Discuss probability mass function of hypergeometric distribution giving one real life example. Obtain its mean and variance. 8+8

3. (A) (a) Define beta distribution of first kind and obtain its mean and variance.

(b) If x and y are independent gamma variables with parameters a and b respectively. Show that $U = x + y$ and $Z = \frac{x}{y}$ are independent and U is $\gamma(a+b)$ variate and Z is $\beta_2(a, b)$ variate. 8+8

OR

(B) (i) Define Weibull distribution. Obtain mean and variance of standard Weibull distribution.

(ii) Define exponential distribution and prove lack of memory property of the distribution. 8+8

4. (A) (a) Define student's 't' variate. Show that for 't' distribution odd ordered moments vanish and find the expression for even order moments.

(b) State and prove Jensen's inequality. 8+8

OR

(B) (i) State and prove Liapunov's inequality.

(ii) Derive relation between F and χ^2 distribution. 8+8

5. (A) (a) What do you mean by order statistic ? Obtain the probability density function of lowest order statistic.