NRJ/KW/17/3061

Bachelor of Science (B.Sc.) Semester—II (C.B.S.) Examination
STATISTICS (PROBABILITY DISTRIBUTIONS)
Compulsory Paper—1

Time : Three Hours]   [Maximum Marks : 50

N.B. :— ALL questions are compulsory and carry equal marks.

1. (A) Derive the p.m.f. of Binomial distribution and find its Mean.

    (B) Suppose that the probability is 0.5 that the sex of the new born baby is female. What is the average number of females in 100 births ? Find the variance of no. of female birth.

    (C) Find mode of Poisson distribution.

    (D) State and prove additive property of Poisson distribution. $2\frac{1}{2}\times4=10$

OR

    (E) Derive the recurrence relation for moments of Poisson distribution. Obtain μ_2, μ_3 and β_1. Comment on Skewness of Poisson distribution.

    (F) For a Binomial distribution with parameters n and p, find mode when (n + 1) p is not an integer. For a binomial distribution, suppose $P(X = 0) = 1 - P(X = 1)$ and $E(X) = 3 V(X)$. Find $P(X = 0)$, $E(X)$ and $V(X)$.   5+5

2. (A) Derive p.m.f. of Negative Binomial distribution. Why is it called so ?

    (B) State and prove lack of memory property of Geometric distribution.

    (C) Among the ten sales executives working in the head office of a company, 4 are women and 6 men. A random sample of 4 executives is selected without replacement from them to constitute a committee. Find the probability that the sample has 2 women executives.

    (D) Consider an experiment of tossing two coins together in which getting two heads is a success. Find the probability of getting the first success in the fifth trial. $2\frac{1}{2}\times4=10$

OR

    (E) Find m.g.f. of negative binomial distribution and hence find its mean and variance.

    (F) Derive p.m.f. of Geometric distribution. Find its m.g.f. and hence find mean and variance of geometric distribution.   5+5

3. (A) State p.d.f. of continuous uniform distribution with parameters a and b, a < b. Find its mean and variance.

    (B) Show that odd ordered central moments of normal distribution are zero.

    (C) Find mode of normal distribution.

    (D) Show that linear combination of K independent normal variables is a normal variable.
                                                        $2\frac{1}{2}\times4=10$

OR

    (E) Derive m.g.f. about origin of normal distribution and hence find mean and variance of normal distribution.

    (F) If random variable X takes values 1, 2, ... N with equal probability, write the p.m.f. of X. Find its mean and variance.   5+5

4. (A) State p.d.f. of exponential distribution. Find its m.g.f. and hence find mean and variance.

(B) State p.d.f. of Beta distribution of First Kind. Find r^{th} raw moment and hence find mean of the distribution. When will this distribution take the form of uniform distribution ?

5+5

OR

(E) State p.d.f. of Gamma distribution with one parameter. Find its m.g.f. and hence find its mean and variance. State and prove additive property of this distribution. 10

5. Solve any **10** questions from the following :

(A) Define standard normal variable and write its p.d.f.

(B) State m.g.f. of standard normal distribution.

(C) If $Z \sim N(0, 1)$ then show that $F(-z) = 1 - F(z)$ in usual notation.

(D) State p.m.f. of Hypergeometric distribution.

(E) If r.v. X follows Hypergeometric distribution with parameters $(n, M, N) = (5, 10, 20)$ find its mean.

(F) Give one real life situation where hypergeometric distribution is used.

(G) State the conditions under which Binomial distribution tends to Poisson distribution.

(H) State whether the following statement is true or false. Justify.

"The Mean of Binomial distribution is 5 and standard deviation is 3".

(I) Find p.g.f. of binomial distribution.

(J) Name the continuous distribution which possesses lack of memory property.

(K) State p.d.f. of Beta distribution of second kind.

(L) Name the continuous distribution for which mean and variance are same. $1 \times 10 = 10$