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) Obtain the mode of a binomial distribution in the following two cases :

(i) (n + 1) p is an integer (ii) (n + 1)p is not an integer.

The mean of binomial distribution is 4 and its variance is $^4/_3$. Find its mode. 10

OR

(E) Obtain the first three raw moments about origin for a Poisson distribution. Hence obtain μ_2, μ_3 and β_1. Comment on the skewness of this distribution. 10

2. (A) Derive the pmf of Geometric distribution. Obtain its moment generating function. Hence find its mean and variance.

An expert sharpshooter misses a target 5% of the time. Find the probability that she will miss the target for the first time on the sixth shot. 10

OR

(E) Find the mgf of negative binomial distribution. Hence find its mean and variance.

(F) An IRS auditor randomly selects 5 income tax returns from among 20 submitted returns. If it is known that, there are 9 returns with illegitimate deductions out of 20 returns, then find the probability that there is at the most one return with illegitimate deductions in the selected 5 returns.

(G) Derive the pmf of negative binomial distribution.

(H) Find the mean of hypergeometric distribution. 2½×4=10

3. (A) Obtain the mean, variance, median and mode of Normal distribution. 10

OR

(E) Find the moment generating function of normal distribution. Show that a linear combination of independent normal variates is also a normal variate. If X_1 & X_2 are independent normal variables then state the distribution of $X_1 + X_2$ and $X_1 - X_2$.

(F) State one example of a random variable which follows discrete uniform distribution.

If the r.v. X takes values 1, 2, ... 20 with the p.m.f.

$$p(x) = p[x = x] = \frac{1}{20} \forall x = 1,2,.....20.$$

Find the mean and variance. Does this distribution possess a mode ? Comment. 5+5

4. (A) Write the pdf of exponential distribution. Obtain its mfg. Hence find the first three raw moments about origin. Also obtain μ_2, μ_3 and β_1. Comment on the skewness of this distribution. State and prove the lack of memory property of this distribution. 10

OR

(E) For a two parameter Gamma distribution obtain the mgf. Hence obtain its mean and variance.

(F) State the pdf of Beta distribution of second type (kind). Obtain the expression for the r^{th} raw moment about origin. Hence find its mean and variance. 5+5

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

(A) Modes of a Poisson distribution are at x = 2 and x = 3. Find p[x = 0].

(B) State the pgf of binomial distribution with parameters n = 6 and p = $^1/_3$.

(C) If for a Poisson distribution with parameter λ, P[X = 1] = P [X = 2], then state its mean, mode and standard deviation.

(D) Give one real life example of a r.v. where geometric distribution is applicable.

(E) State the parameters of hypergeometric distribution.

(F) A normal distribution is completely specified by its _________ and __________.

(Fill in the blanks and rewrite the sentence)

(G) Write two chief characteristics of normal distribution.

(H) What is the other name of continuous uniform distribution ? Why is it called so ?

(I) Write the pdf of gamma distribution with one parameter.

(J) Let X follow exponential distribution with pdf given by

$$f(x) = 3e^{-3x}, \quad 0 < x < 0$$
$$= 0, \quad \text{otherwise}$$

State its mean and variance.

(K) State the additive property of one parameter gamma distribution.

(L) State two discrete distributions with mean less than variance. 1×10=10