CB – 174

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Second Semester B.Sc. Examination, Aug./Sept. 2023
(CBCS) (Repeaters) (2017-18 and Onwards)
STATISTICS (Paper – II)
Basic Statistics

Time : 3 Hours Max. Marks : 70

Instructions : *1) Answer* ***ten*** *sub-divisions from Section –* ***A*** *and* ***five*** *questions from Section –* ***B****.*

2) Scientific calculators are ***permitted****.*

SECTION – A

Answer **any ten** sub-divisions from the following : **(10×2=20)**

1. a) Define discrete random variable and probability mass function (p.m.f.).

b) Define mathematical expectation of a random variable.

c) Show that $M_{a+X}(t) = e^{at} M_X(t)$.

d) If X is a random variable with p.m.f. f(x) = ax, x = 0, 1, 2, 3. Find constant 'a' and mean.

e) Write any two properties of Poisson distribution.

f) Define hyper geometric distribution.

g) Define rectangular distribution and write its mean and variance.

h) Define joint probability distribution of a random variables.

i) Show that cov(aX, bY) = ab cov(X, Y), where 'a' and 'b' are constants.

j) If X and Y are independent random variables then show that E(XY) = E(X).E(Y).

k) The joint probability density function of a random variables X and Y is given by f(x) = 4 xy, 0 < x < 1, 0 < y < 1. Find marginal distribution of Y.

l) Mention the applications of central limit theorem.

P.T.O.

SECTION – B

Answer **any five** questions from the following : **(5×10=50)**

2. a) Define MGF and explain the methods of generating moments from MGF.

   b) If 'X' is continuous random variable with p.d.f. $f(x) = 4x^3$, $0 < x < 1$ then find mean and variance. **(5+5)**

3. a) Obtain m.g.f. of binomial distribution and examine whether additive property holds good.

   b) Derive mean and variance of Poisson distribution. **(5+5)**

4. a) State and prove lack of memory property of geometric distribution.

   b) Obtain MGF of negative binomial distribution and hence find mean and variance. **(4+6)**

5. a) Obtain r^{th} moment about origin of two parameter gamma distribution and hence find mean and variance.

   b) Compute MGF of rectangular distribution. **(6+4)**

6. a) Obtain MGF of exponential distribution and hence find mean.

   b) Define beta distribution of first kind and find its mean and variance. **(4+6)**

7. a) Show that normal distribution $\mu_{2r} = 1.3.5 \ldots(2r - 1)\, \sigma^{2r}$ and hence find β_2.

   b) Show that a linear combination of independent normal variate is also a normal variate. **(6+4)**

8. a) The joint pdf of random variables X and Y is $f(x, y) = (4x - 3y^2)$, $0 < x < 1$, $0 < y < 1$. Find E(X), E(Y), V(X) and V(Y).

   b) State and prove the addition theorem of mathematical expectations. **(6+4)**

9. a) State and prove the Chebyshev's inequality.

   b) Explain the convergence of Binomial distribution to normal distribution. **(5+5)**
