Second Semester B.Sc. Examination, May 2017
(CBCS) (2014-15 and Onwards) (Fresh + Repeaters)
STATISTICS – II
Basic Statistics – II

Time : 3 Hours Max. Marks : 70

Instructions : *i) Answer* ***five*** *sub-divisions from Section –* ***A, five*** *sub-divisions from Section –* ***B*** *and* ***five*** *questions from Section –* ***C****.*

ii) Answer Section – ***A*** *in* ***first two*** *pages of the answer book.*

iii) Scientific calculators are ***permitted****.*

SECTION – A **(10 Marks)**

1. Answer **any five** sub-divisions from the following : **(5×2=10)**

a) Define discrete uniform distribution and find its mean.

b) If X and Y are two independent Poisson variates having means 4 and 5 respectively. Find the mean and variance of X + Y.

c) If $\mu = 200$ and $\sigma = 15$, find upper and lower quartiles for Normal distribution.

d) Define Chi-square distribution and write its mean and variance.

e) Define :

i) Joint probability density function

ii) Independence of random variables.

f) Establish the relation between correlation coefficient and regression coefficients.

g) Define and explain how one interprets the coefficient of determination.

h) Show that if $R_{1.23} = 1$, then $R_{2.13}$ is also 1.

SECTION – B (15 Marks)

2. Answer **any five** sub-divisions from the following : (5×3=15)

a) Define Hypergeometric variate and give an example.

b) Find the mean of Beta distribution of first kind.

c) The joint probability mass function of random variable X and Y is

$$p(x, y) = \frac{2x + y}{27}, \quad x = 0, 1, 2 \text{ and } y = 0, 1, 2$$
$$= \quad 0 \ , \quad \text{otherwise}$$

Find the marginal distribution of X and Y.

d) Prove that Cov(X + a, Y + b) = Cov(X, Y) where a and b are constants.

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

f) What is curve fitting ? Describe the principle of least squares in curve fitting.

g) Show that $1 - R^2_{1.23} = \left(1 - r^2_{12}\right)\left(1 - r^2_{13.2}\right)$ in a trivariate distribution.

h) Mention the properties of residuals.

SECTION – C (45 Marks)

Answer **any five** questions from the following : (5×9=45)

3. a) Examine the additive property of Binomial distribution.

b) Obtain the moment generating function (M.G.F.) of Poisson distribution and hence obtain mean and variance. (4+5)

4. a) Obtain the probability mass function of Geometric distribution.

b) Define Negative Binomial distribution and find its mean and variance. (3+6)

5. a) Obtain the r^{th} order moment about origin of two parameter Gamma distribution. Deduce its mean and variance.

b) Establish that exponential distribution "Lacks memory". (5+4)

6. a) Define Normal distribution and standard normal distribution. Also obtain the M.G.F. of Normal distribution.

   b) Define Cauchy distribution and show that it is symmetric. **(6+3)**

7. a) Find mean and variance of t-distribution.

   b) If X is $F(n_1, n_2)$ variate, prove that $\frac{1}{X}$ is $F(n_2, n_1)$ variate. **(5+4)**

8. a) The joint p.d.f. of random variable X and Y is given by

$$f(x, y) = \begin{cases} Kxy, & 0 < x < 1 \\ & 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

   Determine the constant k and mean of X and Y.

   b) Prove that the M.G.F. of sum of independent random variables is equal to the product of their M.G.F.'s. **(6+3)**

9. a) Obtain the normal equations for fitting a curve of the type $y = ae^{bx}$.

   b) Define correlation and regression coefficients. Also state their properties. **(4+5)**
