RO-003-1015043 Seat No. ________

B. Sc. (Sem. V) (CBCS) (W.I.F. - 2016) Examination

February - 2019

Statistics : S - 501

(Mathematical Statistics) (New Course)

Faculty Code : 003
Subject Code : 1015043

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) All questions carry equal marks.
(3) Student can use their own scientific calculator.

1 (a) Give the answer of following question : **4**

(1) __________ is a characteristic function of Poisson distribution..

(2) __________ is a characteristic function of Geometric distribution.

(3) __________ is a characteristic function of Standard Normal distribution.

(4) __________ is a characteristic function of Chi-square distribution.

(b) Write any one : **2**

(1) Show that $\phi_x(0) = 1$

(2) Obtain characteristic function of Binomial distribution.

(c) Write any one : **3**

(1) Obtain characteristic function of Normal distribution.

(2) Obtain Probability density function for the characteristic function $\phi_x(t) = e^{-\left(\frac{t^2\sigma^2}{2}\right)}$

(d) Write any one : **5**

(1) State and prove weak law of large number.

(2) Prove that :

(i) $$\mu_r' = (-i)^r \left[\frac{d^r}{dt^r} \phi_x(t) \right]_{t=0}$$

(ii) $$\mu_r = (-i)^r \left[\frac{d^r}{dt^r} \phi_u(t) \right]_{t=0} \quad ; \text{ where } u = x - \mu .$$

2 (a) Give the answer of following question : **4**

(1) For Normal distribution μ_{2n} = __________.

(2) For Normal distribution Mean Deviation = __________.

(3) Measured of Kurtosis coefficient for Normal distribution are __________ and __________.

(4) If two independent variates $X_1 \sim N\left(\mu_1, \sigma_1^2\right)$ and $X_2 \sim N\left(\mu_2, \sigma_2^2\right)$ then $X_1 - X_2$ is distributed as __________.

(b) Write any one : **2**

(1) Obtain median of Normal distribution.

(2) Obtain CGF of Normal distribution and from it show that $\mu_4 = 3\sigma^4$

(c) Write any one : **3**

(1) Show that a linear combination of independent Normal variates is also Normal variate.

(2) Obtain mode of Normal distribution.

(d) Write any one : **5**

(1) Derive Normal distribution.

(2) Obtain MGF of Normal distribution and also show that $\beta_1 = 0$ and $\beta_2 = 3$.

3 (a) Give the answer of following question : **4**

(1) __________ is a moment generating function of $\gamma(\alpha, p)$.

(2) If two independent variates $X_1 \sim \gamma(n_1)$ and $X_2 \sim \gamma(n_2)$ then $\frac{X_1}{X_1 + X_2}$ is distributed as ________.

(3) If two independent variates $X_1 \sim \wedge(\mu_1, \sigma_1^2)$ and $X_2 \sim \wedge(\mu_2, \sigma_2^2)$ then $X_1 \div X_2$ is distributed as __________.

(4) Weibull distribution has application in __________.

(b) Write any one : **2**

(1) Define Gamma distribution and find its mean.

(2) Define Uniform distribution and find its mean.

(c) Write any one **3**

(1) Define Beta distribution of first kind and find its mean and variance.

(2) Obtain the relation between Gamma and Normal distribution.

(d) Write any one

(1) Obtain MGF of Gamma distribution with parameters α and p. Also show that $3\beta_1 - 2\beta_2 + 6 = 0$

(2) Obtain Coefficient of skeness for Log Standard Normal distribution.

4 (a) Give the answer of following question : **4**

(1) If two independent variates $X_1 \sim \wedge(\mu_1, \sigma_1^2)$ and $X_2 \sim \wedge(\mu_2, \sigma_2^2)$ and $X_1 \cdot X_2$ is distributed as __________.

(2) t-distribution curve in respect of tails is always__________.

(3) The mean of the Chi-square distribution is __________ of its variance.

(4) t–distribution with 1 d.f. reduces to __________.

(b) Write any one : **2**

(1) Obtain MGF of χ^2 distribution.

(2) Obtain relation between t-distribution and F-distribution.

(c) Write any one : **3**

(1) Obtain CGF of χ^2 distribution and show that $3\beta_1 - 2\beta_2 + 6 = 0$.

(2) Obtain limiting form of t-distribution for large degrees of freedom.

(d) Write any one : **5**

(1) Derive F-distribution.

(2) Derive t-distribution.

5 (a) Give the answer of following questions : **4**

(1) The range of partial correlation coefficient is __________.

(2) If $r_{12} = 0.28$, $r_{23} = 0.49$, $r_{31} = 0.51$, $\sigma_1 = 2.7$, $\sigma_2 = 2.4, \sigma_3 = 2.7$ then $b_{31.2} =$ __________.

(3) Multiple correlation is a measure of __________. association of a variable with other variables.

(4) Partial correlation coefficients is a measure of association between two variables ____________ the common effect of the rest of the variable.

(b) Write any one : **2**

(1) Usual notation prove that

$$\sigma_{1.23}^2 = \sigma_1^2\left(1 - r_{12}^2\right)\left(1 - r_{13.2}^2\right)$$

(2) Obtain μ_{20} for Bivariate Normal distribution.

(c) Write any one : **3**

(1) Usual notation of multiple correlation and multiple regression, prove that

$$b_{12} = \frac{b_{12.3} + b_{13.2}\, b_{32.1}}{1 - b_{13.2}\, b_{31.2}}$$

(2) Obtain conditional distribution of x when y is given for Bi-variate distribution.

(d) Write any one **5**

(1) Obtain marginal distribution of y for Bi-variate distribution.

(2) Usual notation of multiple correlation and multiple regression, prove that

$$R_{1.23}^2 = \frac{r_{12}^2 + r_{13}^2 - 2r_{12}r_{23}r_{13}}{1 - r_{23}^2}$$
