PAQ-003-1015043

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Seat No. ________

B. Sc. (Sem. V) (CBCS) Examination

October / November - 2018

Statistics : Paper - S - 502

(Mathematical Statistics) (New Course)

Faculty Code : 003

Subject Code : 1015043

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

Instructions : (1) All questions carry **equal** marks.

(2) Students can use their own scientific calculators.

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

(1) __________ is a characteristic function of Binomial 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 $\left|\phi_x(t)\right| \leq 1$.

(2) Obtain characteristic function of Poisson 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 that Chebchev's inequality.

(2) Prove that

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

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

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

(1) For Normal distribution $\mu_r = k_4 + 3k_2^2$ is ________.

(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 MGF of Standard Normal variate.

(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 mean deviation from the mean for Normal distribution.

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

(1) Drive 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 questions : **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 $X_1 \sim \Lambda\left(\mu_1, \sigma_1^2\right)$ and $X_2 \sim \Lambda\left(\mu_2, \sigma_2^2\right)$ then $X_1 \div X_2$ is distributed as ________.

(4) Weibull distribution has application in _______.

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

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

(2) Define Uniform distribution and find its mean.

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

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

(2) Define Exponential distribution and find its mean and variance.

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

(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 skewness for Log Standard Normal distribution.

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

(1) If χ_1^2 and χ_2^2 are two independent Chi-square variates with d.f. n_1 and n_2 respectively, then the distribution of $\dfrac{\chi_1^2}{\chi_1^2 + \chi_2^2}$ is _________.

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

(3) The Chi-square distribution curve for d.f. 3 or more is always _________.

(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) Drive F-distribution.

(2) Drive t-distribution.

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

(1) If $r_{12} = 0.86, r_{13} = 0.65$ and $r_{23} = 0.72$ then $r_{12.3} =$ ________.

(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 coefficient is the simple correlation between __________ variables.

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

(1) Usual notation prove that

$$\sigma^2_{1.23} = \sigma^2_1 \left(1 - r^2_{12}\right)\left(1 - r^2_{13.2}\right).$$

(2) Obtain μ_{20} for Bi-variate 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

$$R^2_{1.23} = \frac{r^2_{12} + r^2_{13} - 2r_{12}\ r_{23}\ r_{13}}{1 - r^2_{23}}.$$
