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HA-003-001543 Seat No. ________

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

May / June – 2017

Statistics : S - 502

(Mathematical Statistics)

(New Course)

Faculty Code : 003

Subject Code : 001543

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

Instructions : (1) All the questions are compulsory.

(2) Students can use their own scientific calculator.

(3) Students can demand log tubal on request.

1 Filling the blanks and short questions. **20**

(1) ________ is a characteristic function of Binomial distribution.

(2) ________ is a characteristic function of Chi-square distribution.

(3) ________ is a characteristic function of Geometric distribution.

(4) ________ is a moment generating function of Standard Normal distribution.

(5) ________ is a moment generating function of $\gamma(p)$.

(6) For Normal distribution μ_{2n} = ________

(7) Measured of Kurtosis coefficient for Normal distribution are ________ and ________

(8) If x follows Gama distribution with parameter p then $\mu_4 = k_4 + 3k_2^2$ is ________

(9) 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 ________.

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

(11) If two independent variates $X_1 \sim \gamma(\alpha, p_1)$ and $X_2 \sim \gamma(a, p_2)$ then $X_1 + X_2$ is distributed as ________.

(12) Weibull distribution has application in __________

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

(14) The range of multiple correlation coefficient R is __________.

(15) The range of partial regression coefficient is __________.

(16) Define Caush's distribution.

(17) Define Log Normal with $\log_e x$ distribution.

(18) Write mean and variance of Gama distribution with parameter (α, p).

(19) Write mean and variance of Weibul distribution.

(20) Write mean and variance of Laplace (double) exponential distribution.

2 (A) Write the answer any **three** 6

(1) Obtain Harmonic mean of Beta distribution of first kind.

(2) If $u = \frac{x-a}{h}$, a and h being constants then $\varnothing_u(t) = e^{(-iat/h)} \varnothing_x(t/h)$

(3) Define Weibul distribution.

(4) Define truncated distribution.

(5) Usual notation of multiple correlation and multiple regression, prove that if $r_{12} = r_{23} = r_{31} = \rho$ then $r_{12.3} = \frac{\rho}{1+\rho}$

(6) Prove that $b_{12.3} = \frac{b_{12} - b_{13}\, b_{23}}{1 - b_{13} b_{23}}$

(B) Write the answer any **three** 9

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

(2) Obtain Probability density function for the characteristic function $\varnothing_x(t) = \left(q + pe^{it}\right)^n$

(3) Define Exponential distribution and obtain its MGF. From MGF obtain its mean and variance.

(4) Define truncated Poisson distribution and also obtain its mean and variance.

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

$$R_{1.23}^2 = b_{12.3}\, r_{12} \frac{\sigma_2}{\sigma_1} + b_{13.2}\, r_{13} \frac{\sigma_3}{\sigma_1}$$

(6) Usual notation of multiple correlation and multiple regression, prove that $\sigma_{1.23}^2 = \sigma_1^2\left(1 - r_{12}^2\right)\left(1 - r_{13.2}^2\right)$

(C) Write the answer any **two** **10**

(1) State and Prove that Chebchev's inequality.

(2) Drive t-distribution.

(3) If x and y are independent X^2 variates with n_1 and n_2 degree of freedom respectively, then obtain distribution of $\frac{x}{x+y}$ *and* $x+y$

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

(5) Usual notation of multiple correlation and multiple regression, prove the $R_{1.23}^2 = \dfrac{r_{12}^2 + r_{13}^2 - 2r_{12}r_{23}r_{13}}{1 - r_{23}^2}$

3 (A) Write the answer any **three** **6**

(1) Define Beta-I and Beta-II distribution.

(2) Obtain characteristic function of Poisson distribution with parameter λ

(3) Define Bivariate normal distribution.

(4) Usual notion of multiple correlation and multiple regression, prove that $\sum X_{1.2} X_{3.12} = 0$

(5) Prove that $\sigma_{3.12}^2 = \dfrac{\sigma_3^2\left(1 - r_{12}^2 - r_{23}^2 - r_{13}^2 + 2r_{12}r_{23}r_{13}\right)}{\left(1 - r_{12}^2\right)}$

(6) In trivariate distribution it is found that $\sigma_1 = 2, \sigma_2 = \sigma_3 = 3, r_{12} = 0.7,\ r_{23} = r_{31} = 0.5$ Find
(i) $b_{12.3}$ (ii) $\sigma_{1.23}$

(B) Write the answer any **three** **9**

(1) Prove that $\mu_r = (-i)^r \left[\frac{d^r}{dt^r} \varnothing_u(t) \right]_{t=0}$; $where\ u = x - \mu$

(2) Obtain MGF of Normal distribution.

(3) Obtain mean and variance of Uniform Distribution.

(4) Define truncated Binomial distribution and also obtain its mean and variance.

(5) Usual notation of multiple correlation and multiple regression, prove that If $r_{12} = r_{23} = r_{31} = r$ then

$$R_{1.23} = R_{2.31} = R_{3.12} = \frac{\sqrt{2r}}{\sqrt{1+r}}$$

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

$$r_{12.3} \frac{\sigma_{1.3}}{\sigma_{2.3}} = -\frac{\sigma_1}{\sigma_2} \left[\frac{r_{23} r_{31} - r_{12}}{1 - r_{23}^2} \right] = b_{12.3}$$

(C) Write the answer any **two** **10**

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

(2) Drive Normal distribution.

(3) Drive F-distribution.

(4) Obtain conditional distribution of x when y is given for Bi–variate distribution.

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

$$r_{12.3} = \frac{r_{12} - r_{13} r_{23}}{\sqrt{\left(1 - r_{13}^2\right)\left(1 - r_{23}^2\right)}}$$
