SLR-ST – 91

Seat No.	

Set **P**

B.Sc. – II (Semester – III) (Old CGPA Pattern) Examination, 2018
STATISTICS (Paper – IV)
Discrete Probability Distributions and Statistical Methods

Day and Date : Friday, 4-5-2018 Total Marks : 70
Time : 10.30 a.m. to 1.00 p.m.

Instructions : *i)* ***All*** *questions are* ***compulsory****.*
ii) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Choose the correct alternative : **14**

i) If X ~ P(1) and Y ~ P(2) are independent then $P\left[X=0 / X+Y=2\right]$ is

a) $\frac{1}{3}$ b) $\left(\frac{2}{3}\right)^2$ c) $\frac{2}{3}$ d) $\left(\frac{1}{3}\right)^2$

ii) Binomial distribution tends to Poisson distribution if

a) $n \to \infty$ b) $p \to 0$ c) $np = \lambda$ d) All the above

iii) If X and Y are two independent Poisson variates such that X ~ P(1) and Y ~ P(2) then P[X + Y < 2] is ____________

a) e^{-3} b) $4e^{-3}$ c) $3e^{-3}$ d) $8.5e^{-3}$

iv) If X ~ Geo(0.8), then the distribution of X + 1 is _______ distribution.

a) Geometric b) Waiting time
c) Poisson d) Negative Binomial

v) If X ~ NB(r, p) such that E(X) = 12 and V(X) = 48, then

a) $r = 4, p = \frac{3}{4}$ b) $r = 12, p = \frac{1}{2}$

c) $r = 4, p = \frac{1}{3}$ d) $r = 4, p = \frac{1}{4}$

P.T.O.

vi) If X is a geometric r.v. then $P\left[{X \geq 6}\big/{X \geq 2}\right]$ is equal to

a) $P[X \geq 2]$ b) $P[X \geq 6]$

c) $P[X \geq 6]/P[X \geq 2]$ d) $P[X \geq 4]$

vii) Let (X_1, X_2, X_3, X_4) be a random vector follows multinomial distribution with usual notations, then $COV(X_2, X_3)$ is

a) $4P_2P_3$ b) $P_2(1-P_3)$ c) $-nP_2P_3$ d) $4P_1P_2P_3P_4$

viii) The range of partial correlation coefficient is

a) –1 to 1 b) 0 to 1 c) $-\infty$ to ∞ d) 0 to ∞

ix) If $V(X_{1.23}) = 0$ then

a) $R_{1.23} = 1$ b) $R_{1.23} = 0$

c) $R_{1.23} = 0.5$ d) $R_{1.23}$ cannot be determined

x) The necessary and sufficient condition for the three planes X_1 on X_2 and X_3; X_2 on X_1 and X_3 and X_3 on X_1 and X_2 are coincident is

a) $r_{12} + r_{13} + r_{23} - 2r_{12}r_{13}r_{23} = 1$ b) $r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12}r_{13}r_{23} = 0$

c) $r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12}r_{13}r_{23} = 1$ d) $r_{12} + r_{13} + r_{23} - 2r_{12}r_{13}r_{23} = 0$

xi) With usual notations, the regression equation X_3 on X_1 and X_2 is

a) $X_3 = b_{31.2}X_1 + b_{32.1}X_2$ b) $X_3 = b_{13.2}X_1 + b_{23.1}X_2$

c) $X_3 = b_{12}X_1 + b_{31}X_2$ d) None of these

xii) A measure of linear association of a variable say X_1 with number of other variables $X_2, X_3, ..., X_k$ is

a) Partial correlation b) Simple correlation

c) Multiple correlation d) Auto correlation

xiii) If $R_{1.23} = 1$, then $R_{2.13}$ is equal to

a) 0 b) 0 to 1 c) 1 d) None of these

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xiv) The partial correlation coefficient $r_{13.2}$ is called

a) First order partial correlation b) Zero order partial correlation

c) Second order partial correlation d) None of these

2. Attempt **any seven** of the following : **14**

i) Define Poisson distribution.

ii) Let X be geometric variate with parameter p, then show that $P[X \geq x] = (1-p)^x$.

iii) Define multinomial distribution.

iv) Obtain the mean of waiting time distribution.

v) State the two properties of residual.

vi) Define Multiple correlation coefficient.

vii) Write the equations of regression plane of x_2 on x_1 and x_3 and x_3 on x_1 and x_2 in terms of co-factors.

viii) If $r_{13.2} = 0$, then prove that $r_{12.3} = r_{12}\sqrt{\dfrac{1-r_{23}^2}{1-r_{13}^2}}$.

ix) If $r_{12} = r_{13} = r_{23} = r \neq 1$, then show that $r_{12.3} = \dfrac{r}{1+r}$.

3. A) Attempt **any two** of the following : **10**

i) Obtain the marginal distribution of X_1 from multinomial distribution.

ii) Let X be a Poisson variate with parameter λ, then show that $\mu_1' = \lambda$ and $\mu_2' = \lambda^2 + \lambda$.

iii) Let $x_{1.3}$ and $x_{2.3}$ be variables x_1 and x_2 after removing the linear effect of x_3 from them. Then show that in usual notations, $b_{12.3} = \dfrac{\text{cov}(x_{1.3}, x_{2.3})}{v(x_{2.3})}$.

B) If $r_{12} = r_{13} = r_{23} = \rho$, then show that $1 - R_{1.23}^2 = \dfrac{(1-\rho)(1+2\rho)}{(1+\rho)}$. **4**

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4. Attempt **any two** of the following : **14**

   i) Derive Poisson distribution as a limiting case of a binomial distribution.

   ii) Define the residual of variable X_1 with respect X_2 and X_3 and obtain its variance in terms of simple correlation coefficient.

   iii) If $X_1 = Y_1 + Y_2$, $X_2 = Y_2 + Y_3$, $X_3 = Y_3 + Y_1$ where Y_1, Y_2, Y_3 are mutually uncorrelated variables with mean zero and unit standard deviation, find $R_{1.23}$.

5. Attempt **any two** of the following : **14**

   i) State and prove the additive property of negative binomial distribution. Also state and prove the recurrence relation for probabilities of negative binomial distribution.

   ii) Obtain probability generating function of the Poisson distribution. Hence or otherwise find mean and variance.

   iii) Define partial correlation coefficient. If the relation $aX_1 + bX_2 + cX_3 = 0$ holds for all sets of values X_1, X_2 and X_3 find $r_{12.3}$.

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