2411N806

Candidate's Seat No :_____

B.Sc. (NEP) Sem.-3 Examination

DSC-C-232

Statistics

Time : 2-00 Hours] **November-2025** **[Max. Marks : 50**

Instructions:

1. All questions are compulsory and carry equal marks.
2. Figures to the right indicate full marks of the questions/sub-questions

Q. 1 a Explain, in case of Bivariate distribution, joint probability density function, marginal and conditional distribution, independence of variables. **05**

b If the joint probability mass function of random variables (X,Y) is **05**

$$p(x,y)=\begin{cases} c(xy-1) & ,x=2,3;y=1,2 \\ 0 & ,otherwise \end{cases}$$

Determine the value of a constant "c", and find P(X=2).

OR

a The joint probability density function of random variables (X,Y) is **05**

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

Determine a constant k. Check whether the random variables are independent or not.

b State the joint probability density function of Bivariate Normal Distribution. **05**

If $(X,Y)\sim BVN(\mu_1,\mu_2,\sigma_1^2,\sigma_2^2,\rho)$, then show that $X\sim N(\mu_1,\sigma_1^2))$

Q. 2 a Karl Pearson's coefficient of Correlation. Hence or otherwise show that $-1\leq r\leq 1$. **05**

b X and Y are two random variables with variances σ_1^2 and σ_2^2 respectively r is the coefficient of correlation between them. If U = X + kY and $V = X + \left(\frac{\sigma_x}{\sigma_y}\right)Y$, find the value of k so that U and V are uncorrelated. **05**

OR

a In usual notations, prove that spearman's correlation coefficient is $r = 1 - \frac{(6\Sigma d^2)}{n(n^2-1)}$ **05**

b Write a note on scatter diagram. **05**

Q. 3 a In usual notations, derive the regression equation of Y on X. **05**

b The regression lines of Y on X and X on Y are y = ax+b and x = cy+d respectively, then obtain correlation coefficient between X and Y. **05**

OR

a State properties of regression coefficients. **05**

P.T.O.

If one regression coefficient is greater than one, the second coefficient is less than one.

b In usual notations, prove that $tan\theta = \frac{1-r^2}{r}\left(\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}\right)$, where notations carry their usual meanings. **05**

Q. 4 a Define multiple and partial correlation coefficients, residue, residue with primary and secondary subscripts. **05**

b In usual notation, in context of Multiple regression, for three variables, prove that $r_{xy} + r_{yz} + r_{zx} \geq \frac{-3}{2}$. **05**

OR

a State properties of residues. Hence or otherwise, prove any one property. **05**

b Show that $r_{12.3}\, r_{23.1}\, r_{31.2} = b_{12.3}\, b_{23.1}\, b_{31.2}$ **05**

Q. 5 **Answer ANY TEN (10) from following** **10**

1 If random variables (X,Y) are independent, $f(x,y) = h(x)f(y|x)$. Is it true?

2 Define conditional expectation,

3 For a bivariate data, if $\Sigma d_i^2 = 231$, and rank correlation is -0.4, then find the value of n, number of paired observations.

4 Define Probable error.

5 Draw a scatter diagram that shows positive correlation.

6 If r=0.8, $\sigma_x = 4$, and $b_{yx} = 0.4$ then find the values of σ_y and b_{xy}.

7 If r=0.6 for a pair of 64 observations, find probable error. Also, determine limits for the population correlation coefficient.

8 For a geometric curve $y = ab^x$, write two normal equations.

9 When the correlation coefficient r = ±1, then. the two regression lines. Select an appropriate option from following
(a) are perpendicular to each- other; (b) coincide, (c) parallel to each other, (d) do not exist.

10 There is no relationship between 'correlation coefficient and regression coefficient. Is it true?

11 If $r_{12} = 0.7, r_{23} = r_{31} = 0.5$, then find $r_{13.2}$.

12 If $r_{12} = 0.7, r_{23} = r_{31} = 0.5, \sigma_1 = 2, \sigma_2 = \sigma_3 = 3$, obtain $b_{23.1}$