

Module 2
Statistical Techniques II

MCQ (1 Mark)

31. The spearman rank correlation coefficient is given by.....(CO2)
- $r = 1 - 6 \frac{\sum d^2}{n(n^2-1)}$
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 - $r = 1 - 6 \frac{\sum d^2}{(n^3-1)}$
32. If the regression coefficients are 0.8 and 0.2, then value of coefficient of correlation is.... (CO2)
- 0.14
 - 0.8
 - 0.4
 - 0.02
33. Two lines of regression are $x + 2y - 5 = 0$, $2x + 3y - 8 = 0$ then mean value of x and y are respectively: (CO2)
- 4,7
 - 1,2
 - 1, -2
 - None of these.
34. The normal equation for fitting of a straight line $y = 5 + 6x$ is $\sum y$ is.. (CO2)
- $5n + 6 \sum x$
 - $5n^2 + 6 \sum x^2$
 - $5n + 6 \sum x^2$
 - $5 + 6 \sum x$
35. Relation between coefficient of correlation and regression coefficient can be written as (CO2)
- $r = b_{yx} \times b_{xy}$
 - $r = \sqrt{b_{yx} \times b_{xy}}$
 - $r = \sqrt{b_{yx} + b_{xy}}$
 - None of these
36. The main purpose of curve fitting is to: (CO2)
- Differentiate data points
 - Create noise in data
 - Find a Curve that best fits a dataset
 - None these

37. For a fitting of Parabolic curve $= a + bx + cx^2$, then number of normal equations are: (CO2)

- A. 1
- B. 2
- C. 3
- D. 4

38. The Karl Pearson correlation coefficient lies between: (CO2)

- A. 0 and 1
- B. -1 and +1
- C. $-\infty$ and $+\infty$
- D. 0 and ∞

39. For two variables X and Y, the Karl Pearson correlation is +0.95. If X increases by 10%, inferred about Y can be.... (CO2)

- A. Y always increases by 10%
- B. Y increases approximately but not necessarily by 10%
- C. Y remains constant
- D. Y decreases by 10%

40. If the regression equation is $y = -2x + 10$, then the predicted value of y at $x=3$: (CO2)

- A. 7
- B. 16
- C. 13
- D. 4

Very Short Answer type Questions (2 marks)

41. If the coefficient of correlation $r = \pm 1$, Elaborate the nature of both lines of regression. (CO2)

Solution:

42. Write normal equations for fitting of the curve $y = ae^{-3t}$ (CO2)

Solution:

43. Calculate the coefficient of correlation between the value of x and y: (CO2)

x	1	2	3	4
y	2	4	6	8

Solution:

44. Show that Correlation coefficient is the geometric mean between the regression Coefficients. (CO2)

Solution:

45. If the regression coefficient are -0.8 and -0.2, what would be the value of coefficient of correlation? (CO2)

Solution:

46. The two regression equations for variables x and y are $3x + 2y = 26$ and $6x + y = 31$. Find the mean values of x and y. (CO2)

Solution:

Short Answer Type Questions (6 Marks)

47. Fit a second-degree polynomial curve $y = a + bx + cx^2$ using least squares method to the data: (CO2)

x	1	2	3	4
y	1	4	9	16

Solution:

48. Calculate Spearman's rank correlation coefficient for the data with Tied-ranks: (CO2)

X	50	60	60	70	80
Y	55	65	65	70	90

Solution:

49. Fit a power model $y = ax^b$ by transforming it into a linear form: (CO2)

x	2	3	4	5
y	4.5	9.0	16.5	25.0

Solution:

50. Using the given data, compute the regression equation $Y = a + bx + cz$ (CO 2)

x	5	6	7	8
y	3	2	4	5
z	10	12	15	18

Solution:

51. Compute the Karl Pearson coefficient of correlation for the data: (CO2)

X	10	20	30	40	50
Y	15	25	35	45	60

Solution:

52. The ranks obtained by 8 students in two tests are as follows:

Test A	1	2	3	4	5	6	7	8
Test B	2	1	4	3	6	5	7	8

Calculate Spearman's rank correlation coefficient. (CO2)

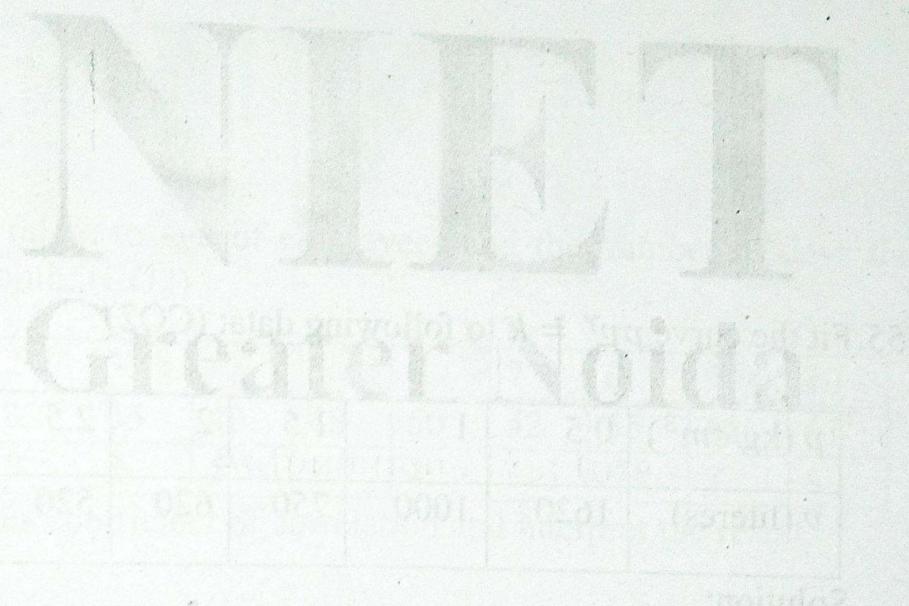
Solution:

53. A housing agency wants to predict house prices based on area (sq.ft.) and number of bedrooms. Data for 4 houses is given below: (CO2)

Area (Sq.ft.)	1000	1200	1500	1800
Bedrooms	2	3	3	4
Price(Lakh)	50	60	70	80

Build a multiple linear regression model and estimate the price of a house with 1600 sq.ft. and 3 bedrooms. Explain how each factor contributes to the price.

Solution:

**Long Answer Type Questions (10 Marks)**

54. Fit a second-degree parabola to the following data: (CO2)

x	1	2	3	4	5	6	7	8	9
y	2	6	7	8	10	11	11	10	9

Solution:

55. Fit the curve $p v^\gamma = k$ to following data: (CO₂)

p (kg/cm ³)	0.5	1	1.5	2	2.5	3
v (literes)	1620	1000	750	620	520	460

Solution:

56. The following data relate to age of employees and the number of days they reported sick in a month: (CO2)

Employees	1	2	3	4	5	6	7	8	9	10
Age	30	32	35	40	48	50	52	55	57	61
Sick days	1	0	2	5	2	4	6	5	7	8

Calculate Karl Pearson's coefficient of correlation and interpret the result.

Solution:

57. Obtain the Spearman's rank correlation coefficient between the variables x and y from the following data: (CO2)

x	50	55	65	50	55	60	50	65	70	75
y	110	110	115	125	140	115	130	120	115	160

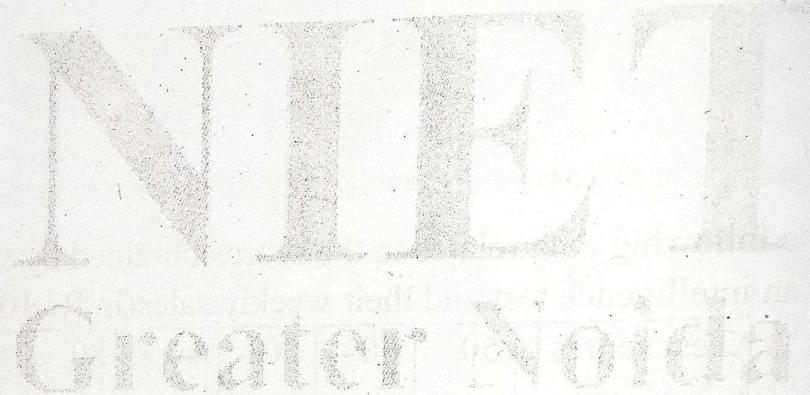
Solution:

58. The following data relates to the scores obtained by the salesman of a company in an intelligence test and their weekly sales(in Rs 1000's) (CO2)

Test scores	50	60	50	60	80	50	80	40	70
Weekly sales	30	60	40	50	60	30	70	50	60

- (i) Obtain the linear regression equation of sales on intelligence test scores of the salesman.
- (ii) If intelligence test scores of the salesman is 65, what would be his expected weekly sale?

Solution:



59. The following results were obtained from marks in applied Mechanics and Mathematics in an examination: (CO2)

	Mechanics(x)	Mathematics(y)
Mean	47.5	39.5
Standard Deviation	16.8	10.8

Coefficient of correlation is 0.95. Find both the regression equations. Also estimate the value of y for x = 30.

Solution:



60. Find the multiple linear regression of y on x and z: (CO2)

x	1	2	3	4
y	0	1	2	3
z	12	18	24	30

Solution: