MIT Arts, Design and Technology University, Rajbaug, Pune

MIT School of Engineering

B.TECH. (Computer Science and Engineering), T.Y.SEM-V

**Probability and Queueing Theory**

**UNIT-II**

**ASSIGNMENT-II**

**Q.1.** Define the following terms:

(i) Correlation (ii) Regression (iii) Positive Correlation (iv) Negative Correlation

**Q.2.** Find (i) Marginal distributions f(x) and g(y)

(ii) E (X) and E (Y)

|  |  |  |  |
| --- | --- | --- | --- |
| Y  X |  | 2 | 7 |
| 1 |  |  |  |
| 5 |  |  |  |

**Q.3**. Given that joint density function

Find g (x) and f (x/y).

**Q.4.** Find the joint distribution of X and Y which are independent random variable with the following respective distributions.

Show that Cov (X, Y) = 0

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | 5 | 8 |
|  |  |  |  |

|  |  |  |
| --- | --- | --- |
|  | 1 | 2 |
|  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks in Chemistry | 35 | 23 | 47 | 17 | 10 | 43 | 9 | 6 | 28 |
| Marks in Mathematics | 30 | 33 | 45 | 23 | 8 | 49 | 12 | 4 | 31 |

**Q.5.** The marks obtained by 9 students in chemistry and mathematics are given below:

Compute their ranks in the above two subjects and the coefficient of correlation of ranks.

**Q.6.** Obtain Regression lines for the following data:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | 6 | 2 | 10 | 4 | 8 |
| y | 9 | 11 | 5 | 8 | 7 |

**Q.7.** For a bivariate data the mean value of x is 20 and the mean value of y is 45.The regression coefficient of y on x is 4 and that of x on y is 1/9.Find

(i) The coefficient of correlation (ii) The S.D of x, if S.D of y is 12.

**Q.8.** Find (i) Marginal distributions f(x) and g(y)

(ii) E (X) and E (Y)

|  |  |  |  |
| --- | --- | --- | --- |
| Y  X |  | 2 | 7 |
| 1 |  |  |  |
| 5 |  |  |  |

**Q.9.** The regression equations are and

The value of variance of x is 9.

Find

1. The mean values of x and y
2. The correlation x and y and
3. The standard deviation of y.

**Q.10.** If

are two lines of regression, find

1. Mean value of x and y
2. The regression coefficient

**Q.11.** From a group of 10 students, marks obtained by each in papers of Mathematics and Applied Mechanics are given as

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| x marks in Maths | 23 | 28 | 42 | 17 | 26 | 35 | 29 | 37 | 16 | 46 |
| Y Marks in App. Mech | 25 | 22 | 38 | 21 | 27 | 39 | 24 | 32 | 18 | 44 |

Calculate Karl’s Pearson’s Coefficient of correlation.

**Q.12.** The overall percentage of failures in a certain examination is 20. If six candidates appear in the examination, what is the probability that at least five pass the examination?

**Q.13.** From the following data estimate the most likely height of a sister whose brother’s height is 71Cm. Brother’s mean height is 67 Cm with S.D. is 3.5 Cm, sister mean height is 65Cm with S.D. is 2.5 Cm and the correlation coefficient is 0.8.

**Q.14.** If the two lines of regression are and and the means of *x* and *y* are 2 and respectively, find the values of and the coefficient of correlation between *x* and *y*.

**Q.15.** Find the correlation coefficient between x and y, when the lines of regression are and

**Q.16.** Find the rank correlation for the following data:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X: | 56 | 42 | 72 | 36 | 63 | 47 | 55 | 49 | 38 | 42 | 68 | 60 |
| Y: | 147 | 125 | 160 | 118 | 149 | 128 | 150 | 145 | 115 | 140 | 152 | 155 |

**Q.17.** Two gents X and Y are asked to rank 7 different type of shirts. The ranks assigned by them are given below:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Shirts | A | B | C | D | E | F | G |
| Rank given by X | 2 | 1 | 4 | 3 | 5 | 7 | 6 |
| Rank given by Y | 1 | 3 | 2 | 4 | 5 | 6 | 7 |

Calculate Spearman’s rank correlation coefficient.

**Q.18.** Determine rank correlation for the following data which shows the marks obtained in two quizzes in mathematics:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Marks in 1st quiz (X) | 6 | 5 | 8 | 8 | 7 | 6 | 10 | 4 | 9 | 7 |
| Marks in 2nd quiz (Y) | 8 | 7 | 7 | 10 | 5 | 8 | 10 | 6 | 8 | 6 |

**Q.19.** Given that joint density function

Find g (x) and f (x/y).

**Q.20.** Predict Y at X = 5 by fitting a least squares straight line to the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X | 2 | 4 | 6 | 8 | 10 | 12 |
| Y | 1.8 | 1.5 | 1.4 | 1.1 | 1.1 | 0.9 |

**Q.21.** The following table gives, according to age, the frequency of marks obtained by 100 students in an intelligence test.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age in years  Marks | 18 | 19 | 20 | 21 | Total |
| 10-20 | 4 | 2 | 2 | - | 8 |
| 20-30 | 5 | 4 | 6 | 4 | 19 |
| 30-40 | 6 | 8 | 10 | 11 | 35 |
| 40-50 | 4 | 4 | 6 | 8 | 22 |
| 50-60 | - | 2 | 4 | 4 | 10 |
| 60-70 | - | 2 | 3 | 1 | 6 |
| Total | 19 | 22 | 31 | 28 | 100 |

Calculate the correlation Coefficient.

**Q.22.** Calculate correlation coefficient r for the following data:

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| X: | 63 | 50 | 55 | 65 | 55 | 70 | 64 | 70 | 58 | 68 | 52 | 60 |
| Y: | 87 | 74 | 76 | 90 | 85 | 87 | 92 | 98 | 82 | 91 | 77 | 78 |

**Q.23.** The following marks have been obtained by a group of students in Engineering Mathematics

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Paper-I | 80 | 45 | 55 | 56 | 58 | 60 | 65 | 68 | 70 | 75 | 85 |
| Paper-II | 82 | 56 | 50 | 48 | 60 | 62 | 64 | 65 | 70 | 74 | 90 |

Calculate the coefficient of correlation.

**Q.24.** Find a least square straight line for the following data:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| X: | 1 | 2 | 3 | 4 | 5 | 6 |
| Y: | 6 | 4 | 3 | 5 | 4 | 2 |

And estimate (predict) Y at X = 4 and X at Y = 4.