Assignment of statistics

Q1. By the method of least squares, find the straight line that best fits the following data:

X	1	2	3	4	5
Y	14	27	40	55	68

Ans. **Y=13.6x**

Q2. Show that the line of fit to the following data is given by y = 0.7x + 11.285

x	0	5	10	15	20	25
y	12	15	17	22	24	30

Q3. The marks secured by recruits in the selection test (X) and the proficiency test (Y) are given below

Serial No.	1	2	3	4	5	6	7	8	9
X	10	15	12	17	13	16	24	14	22
Y	30	42	45	46	33	34	40	35	39

Calculate the rank correlation co-efficient **Ans. r = 0.4**

Q4. A sample of 12 fathers and their eldest sons gave the following data about their heights in inches:

Father	65	63	67	64	68	62	70	66	68	67	69	71
Son	68	66	68	65	69	66	68	65	71	67	68	70

Calculate the co-efficient of rank correlation **Ans. r = 0.722**

Q5. Find the coefficient of correlation between x and y from the table of their values:

X	1	3	4	6	8	9	11	14
Y	1	2	4	4	5	7	8	9

Ans. 0.977

Q6. Calculate the coefficient of correlation between x and y series from the following data:

$\sum(x-\bar{x})^2 = 136, \quad \sum(y-\bar{y})^2 = 138, \sum(x-\bar{x})(y-\bar{y}) = 122$

Q7. The following results were obtained from marks in Applied Mechanics and Engineering Mathematics in an examination:

	Applied Mechanics	Engineering Mathematics
Mean	47.5	39.5
Standard deviation	16.8	10.8

Find both the regression equations. Also estimate the value of y for x=30

Q8. In a study between the amount of rainfall and the quantity of air pollution removed the following data were collected:

Daily rainfall (in .01 cm)	4.3	4.5	5.9	5.6	6.1	5.2	3.8	2.1
pollution removed (mg/m^3)	12.6	12.1	11.6	11.8	11.4	11.8	13.2	14.1

Find the regression line of y on x.

Q9. Two lines of regression is given by

$$x + 2y - 5 = 0 \quad and \quad 2x + 3y - 8 = 0 \quad and \text{ variance of x} = 12$$

Calculate:

a. the mean values of x and y b. variance of y

c. correlation coefficient $r(x, y)$

Q10. An analyst for a company was studying travelling expenses (y) in rupees and duration (x) of these trips for 102 sales trip. He has found relation between x and y linear and data as follow:

$$\sum x = 510, \sum y = 7140, \sum x^2 = 4150, \sum xy = 54900, \sum y^2 = 740200$$

Calculate: (i) Two regression lines

(ii) A given trip has to take 7 days. How much money should be allowed so that they will not run short of money?

Q11. Fit a binomial distribution to the following frequency data:

x	0	1	2	3	4
f	30	62	46	10	2

Q12. (a) A binomial variable X satisfies the relation 9P (X=4) = P (X = 2) when n = 6. Find the value of the parameter p and P (X = 1).

Ans. P = ¼, P (X = 1) = 0.3559

(b) In 800 families with 5 children each, how many families would be expected to have

(i) 3 boys and 2 girls (ii) 2 boys and 3 girls (iii) no girl (iv) at the most two girls. (Assume probabilities for boys and girls to be equal)

Ans. (i) 250 (ii) 250 (iii) 25 (iv) 400

(c) If the probability of hitting the target is 10% and 10 shots are fired independently. What is the probability that the target will hit at least once. **Ans. 0.6513**

Q13. Suppose that after losing a large amount of money, an unlucky gambler questions whether the game was fair and the die was really unbiased. The last 90 tosses of this die gave the following results,

Number of dots on the die	1	2	3	4	5	6
Number of times it occurred	20	15	12	17	9	17

Test whether the die is biased or unbiased. (Given that the tabulated value of chi square at 5 degrees of freedom at 5% level of significance = 11.07)

Q14. Test the hypothesis that there is no difference in the quality of the four kinds of tyres A, B, C and D based on data given below. At 5% level of significance.

	Tyre Brand			
	A	B	C	D
Failed to last 40,000 kms	26	23	15	32
Lasted from 40,000 kms to 60,000 kms	118	93	116	121
Lasted more than 60,000 kms	56	84	69	47

(Given that the tabulated value of chi square at 6 degrees of freedom at 5% level of significance = 5.348)

Q15. The following figures show the distribution of digits in numbers chosen at random from a telephone directory:

Digits	0	1	2	3	4	5	6	7	8	9	Total
Frequency	1026	1107	997	966	1075	933	1107	972	964	853	10,000

Test whether the digits may be taken to occur equally frequently in the directory.

Q16. Out of 8,000 graduates in a town 800 are females, out of 1,600 graduate employees 120 are females. Use Chi-square to determine if any distinction is made in appointment on the basis of sex. (Given that the tabulated value of chi square at 1 degree of freedom at 5% level of significance = 3.84)

(17) Suppose it has been observed that, on average, 180 cars per hour pass a specified point on a particular road in the morning rush hour. Due to impending roadwork's it is estimated that congestion will occur closer to the city centre if more than 5 cars pass the point in any one minute. What is the probability of congestion occurring?

Ans: 0.0839

(18) The mean number of bacteria per millilitre of a liquid is known to be 6. Find the probability that in 1 ml of the liquid, there will be: (a) 0 (b) 1 (c) 2 (d) 3 (e) less than 4 (f) 6 bacteria.

Ans: (a) 0.00248 (b) 0.0149 (c) 0.0446 (d) 0.0892 (e) 0.1512 (f) 0.1606

(19) A Council is considering whether to base a recovery vehicle on a stretch of road to help clear incidents as quickly as possible. The road concerned carries over 5000 vehicles during the peak rush hour period. Records show that, on average, the number of incidents during the morning rush hour is 5. The Council won't base a vehicle on the road if the probability of having more than 5 incidents in any one morning is less than 30%. Based on this information should the Council provide a vehicle?

Ans: Yes.