Subject: Business Statistics - I | Course Code: MGMT 321
Full Marks: 100 | Time: 3 Hours

You are required to answer in your own words as far as applicable. Figures in the margins indicate full marks.

SECTION A: VERY SHORT ANSWER QUESTIONS (10X2 = 20 MARKS)

Answer ALL questions.

Q1.   What do you mean by primary data and secondary data?

Q2.   Find the most repeated value by empirical relationship if mean $(\bar{X})$ = 42.2 and median = 41.9.

Q3.   Arithmetic mean of 50 terms is 98. Two items 60 and 70 were left out at the time of calculations. What is the correct mean of all items?

Q4.   The following calculation were based on the life of refrigerators of two companies:

	Company A	Company B
Average life	8 years	6 years
Standard deviation	12 years	8 years

Which company's refrigerators show greater consistency in terms of life?

Q5.   The sum of square of differences in ranks of 10 pairs of observations is 36. Find the rank correlation coefficient.

Q6.   The coefficient of correlation between 10 pairs of values of demand and supply was found to be 0.8. Test the significance of the result.

Q7.   Define Identity matrix with example.

Q8.   If A= $\begin{pmatrix} 3 & 2 \\ 5 & 7 \end{pmatrix}$ then find A^{-1}.

Q9.   Define determinant of a matrix. Write down any 3 properties of determinant.

Q10.   Evaluate: $\begin{vmatrix} a+b & a-b \\ a-b & a+b \end{vmatrix}$

SECTION B: SHORT ANSWER QUESTIONS (6 X 8 = 48 MARKS)

Answer any SIX questions:

Q11.   The modal mark for a group of 47 students is 27. Five students got marks between 0 to 10, 15students got marks between 20-30 and 7 students got marks between 40-50. Find the number of students getting marks between 10-20 and 30-40, if the maximum mark in the test was 50.   [8]

Q12.   The combined mean and variance of salaries of 250 workers of city A and city B are 560 and 5497 respectively. The mean and variance of the salaries of 150 workers of city B are 500 and 81 respectively. Find the variance of salary of workers of city A.   [8]

Q13.   From the following data find out the missing frequencies and compute the standard deviation of the distribution if the average number of tablets to cure was 20.96.   [8]

No. of tablets	4-8	8-12	12-16	16-20	20-24	24-28	28-32	32-36	36-40	Total
No. of person cured	10	12	14	16	?	16	?	10	5	115

Q14.   While calculating the coefficient of correlation between two variables X and Y the following results were obtained:

N =25	$\sum X$ =125	$\sum Y$ = 100
$\sum X^2$ = 650	$\sum Y^2$ = 460	$\sum XY$ =508

Later it was found that two pairs of observations were wrongly entered as (6, 14) and (8, 6) instead of (8, 12) and (6, 8) respectively. Calculate the correct value of correlation coefficient.   [8]

Q15.   The coefficient of rank correlation between the debenture prices and share prices of a company was +0.8. If the sum of the squares of the difference in ranks was 33, find the value of n.   [8]

Q16. The following table shows the number of motor registration and the sales of Gorakhali motor tyres by a wholesale dealer in Kathmandu for the term of 5 years.

Year	1	2	3	4	5
No. of motor registered ('000')	60	63	72	75	80
No. of tyres sold ('000')	125	110	130	135	150

a) Estimate the sale of tyres when expected motor registration in nest year is 90,000. [4]

b) Also calculate the correlation coefficient and interpret the result. [4]

Q17. Prove that: $\begin{vmatrix} x^2+1 & xy & xz \\ xy & y^2+1 & yz \\ xz & yz & z^2+1 \end{vmatrix} = 1+x^2+y^2+z^2$ [8]

Q18. If $A = \begin{pmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{pmatrix}$, find A^{-1} and verify that $AA^{-1} = I$ [8]

SECTION C: LONG ANSWER QUESTIONS (2 X 16 = 32 MARKS)

*Answer any **TWO** questions.*

Q19. The following are the weekly production in units (output) of 60 workers of a factory.

72	23	48	51	64	82	12	33	50	39	57	35
88	77	25	39	52	48	64	49	52	41	72	62
49	32	54	67	46	55	57	82	44	75	56	51
63	59	69	53	42	75	85	68	55	52	45	40
57	20	75	46	51	50	16	62	56	54	40	55

The management has decided to give bonus of Rs. 5000, Rs. 6000, Rs. 7000, Rs.8000 and Rs. 9000 to each worker in the respective output group 40 to 50, 50 to 60 and so on.
Find:
   i.   Mean output of all the workers [4]
   ii.   Average bonus received by the workers [4]
   iii. Standard deviation of bonus. [8]

Q20. A consumer products company wants to measure the effectiveness of different types of advertising media in the promotion of its product. Specifically, the company is interested in the effectiveness newspaper advertising. A sample 69 cities with approximately equal populations is selected for study during a test period of one month. The data of sales of the product and newspaper advertising media expenditure is given below.

Advertising expenditure	Sales of the product				
	0-500	500-1000	1000-1500	1500-2000	2000-2500
0-200	12	6	-	-	-
200-400	2	18	4	2	1
400-600	-	4	7	3	-
600-800	-	1	-	2	1
800-1000	-	-	1	2	3

Now you are required to find
   i.   Coefficient of variations and correlation coefficient. [12]
   ii. Estimate the total sales of product when the advertising expenditure is Rs. 1200. [4]

Q21. Production of a certain chemical mixture should contain 80 mg of Chlorides, 28 mg of Nitrates and 36 mg of Sulphates per kilogram. The company can use two substances. Substances X contains 8mg of Chlorides, 4 mg of Nitrates and 6mg of Sulphates per gram. Substance Y contains 10 mg of Chlorides, 2mg of Nitrates and 2 mg of Sulphates per gram. Both substances cost Rs. 20 per gram. It is required to produce the mixture using substance X and Y so that the cost is minimized. Formulate the problem as LPP and solve using graphic method. [16]

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