

SARDAR PATEL UNIVERSITY
MCA SECOND SEMESTER EXAMINATIONS
PS02FMCA21: Statistical and Optimization Techniques
22nd October, 2018, Monday

Time: 10.00 AM To 1.00 PM

Marks: 70

Q-1. Select the appropriate answer for the following questions:

[8]

- (i) Which of the following is not a measure of central tendency?
 (a) Arithmetic mean (b) Median (c) Quartile (d) Standard Deviation
- (ii) The Harmonic mean of 3, 4 and 8 is _____.
 (a) 3 (b) 3.43 (c) 4 (d) 8
- (iii) The sum of deviations about the mean is always
 (a) zero (b) positive (c) negative (d) total standard deviation
- (iv) The increase in the sales of departmental store during Christmas is an example of _____ movements of time series.
 (a) Seasonal (b) Cyclic (c) Random (d) None of these
- (v) The number of non-negative variables in a basic feasible solution to $m \times n$ transportation problem is
 (a) $m + n$ (b) $m + n + 1$ (c) $m + n - 1$ (d) None of these
- (vi) Any set $X = \{x_1, x_2, \dots, x_{n+m}\}$ of variable is called a _____ of L.P. Problem if it satisfies the set of constraints and non-negativity restrictions also.
 (a) Solution (b) Feasible Solution (c) Basic Feasible Solution (d) None of these
- (vii) In $n \times m$ transportation problem, to resolve degeneracy during solution stage, the delta is allocated to _____.
 (a) Recently vacated cells (b) the lowest cost cells
- (viii) In simplex method of Linear Programming problem, _____ variables are to be added if the constraint has ' \leq ' sign.
 (a) Slack (b) Surplus (c) Artificial (d) None of these

Q-2. Answer the following questions (Any SEVEN):

[14]

- (i) Define the terms: Statistics and Correlation
- (ii) What do you mean by Dispersion? What is standard deviation?
- (iii) If $S_y = 14.925$ and $r^2 = 0.7686$ then find Standard Error of Estimate of Y on X i.e. $S_{y.x}$.
- (iv) Write the name of the methods for estimation of trend.
- (v) Write Short note on sensitivity analysis
- (vi) List out the steps to solve linear programming problem (LPP) using graphical method.
- (vii) Write atleast two applications of Integer Programming Problem.
- (viii) Write the step to convert unbalanced Assignment problem to Balanced.
- (ix) What do you mean by degeneracy in Simplex method?

Q-3. Do as directed.

- A. Fit the least-square line to the data given in below table, by considering X as dependent variable. [6]

X:	1	2	3	4	5	6
Y:	2	6	7	8	10	11

- B. Find Arithmetic Mean, Median and Mode for the following data: [6]

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	9	15	30	18	5

OR

- B. Find Mean deviation and Standard deviation for the following data: [6]

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	9	15	30	18	5

Q-4. Do as directed.

- A. Considering X to be the independent variable, show that the equation of the least-squares line can be written as [6]

$$y = \frac{\sum xy}{\sum x^2} * x$$

- B. Write a Program / an algorithm to find the least square line when X is independent variable. [6]

OR

- B. Find the coefficient of correlation between the variables X and Y presented in the following table: [6]

X:	1	2	3	4	5	6
Y:	2	6	7	8	10	11

Q-5. Do as directed.

- A. Five salesmen are assigned to five territories. Based on the past performance, the following table shows the annual sales (in rupees in lakhs) that can be generated by each salesman in each territory. Find the optimal assignment. [6]

Territory/Sale sman	A	B	C	D	E
S1	160	130	175	190	200
S2	135	120	130	160	175
S3	140	110	155	170	185
S4	50	50	80	80	110
S5	55	35	70	80	105

- B. Do as directed. [6]
- Write a procedure to solve N jobs through 2-machine problem.
 - How to resolve degeneracy in transportation problem?

OR

- B. Formulate the following problem as Linear Programming Problem. [6]
A toy company manufactures two types of doll: doll A and doll B. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum of 2000 per day. The supply of plastic is sufficient to produce 1500 doll per day (both type A and B combined). The type B requires an extra item N, they are only 600 per day available. If the company makes the profit of Rs. 3 and Rs. 5 for each type A and type B respectively then, how many of each type of doll should be produced per day in order to maximize the total profit.

Q-6. Do as directed.

- A. Use simplex method to solve the following LPP: [6]
Maximize $Z = 3x_1 + 2x_2$
Subject to the constraints
 $x_1 + x_2 \leq 4$
 $x_1 - x_2 \leq 2$
and $x_1, x_2 \geq 0$

- B. A cement factory manager is considering the best way to transport cement from three manufacturing centers P, Q and R to depots A, B, C, D and E. The weekly production and demands along with transportation costs per ton are given below: [6]

Warehouse/Factory	A	B	C	D	E	Production (tons)
P	4	1	3	4	4	60
Q	2	3	2	2	3	35
R	3	5	2	4	4	40
Demand (tons)	22	45	20	18	30	135

Find the initial basic feasible solution using Vogel's Approximation Method.

OR

- B. Obtain the dual of the following Linear programming problem. [6]
Maximize $Z = 4X_1 + X_2 + 7X_3$
Subject to $X_1 + X_2 + X_3 = 10$
 $5X_1 - X_2 + X_3 \geq 12$
 $X_1 + 7X_2 - 3X_3 \leq 4$
and $X_1, X_2, X_3 \geq 0$

→ X ←

③

