(34)

SARDAR PATEL UNIVERSITY
MCA SECOND SEMESTER EXAMINATIONS - 2019
PS02FMCA01: Statistical and Optimization Techniques
4th April 2019 Thursday

Time: 10.00 AM To 1.00 PM   **Marks: 70**

Q-1. **Select the appropriate answer for the following questions:**   **[8]**

(i)   If the standard deviation of a population is 9, the population variance is _____.
(a) 3   (b) 6   (c) 9 .   (d) 81

(ii) The median of the given the set of numbers 1, 2, 7, 5, 3, 8, 4, 1 and 2 is ____.
(a) 1   (b) 2   (c) 3   (d) 4

(iii) The arithmetic mean of 10 numbers is 9, then the sum of these numbers will be ___.
(a) 10   (b) 9   (c) 90   (d) 0.9

(iv) Which of the following is not a measure of dispersion?

(a) Range   (b) Arithmetic mean
(c) Standard deviation   (d) Variance

(v)   A non-negative variable subtracted from the left side of greater than type inequality to

convert it in equation form in LPP is called _____ variable.

(a)   Surplus   (b)   Slack   (c)   artificial   (d) None of given

(vi) Any set $X = \{ x_1, x_2, ..., x_{n+m}\}$ 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 given

(vii) In the graphical procedure, if the inequality-constraint corresponding to that line is <=,

then the region _____ the line lying in the first quadrant is shaded.

(a)   above   (b)   below   (c)   on   (d) None of given

(viii) In transportation problem, a feasible solution to m-origin, n-destination problem is said
to be basic if the number of positive allocations are
(a) exactly m + n – 1   (b) Less than m + n – 1   (c) more than m + n – 1   (d) None of given

Q-2. **Answer the following questions (Any SEVEN):**   **[14]**

(i)   Define the terms: statistics and Regression

(ii) Explain the steps to draw frequency histogram with example.

(iii) Write the properties of Arithmetic mean.

(iv) What is multiple correlation and partial correlation?

(v)   Define the Integer Programming Problem. Write its two applications.

(vi) Write the procedure to convert unbalanced Assignment problem into balanced.

(vii) Define Operation Research.

(viii) Write the use of Critical Path Method (CPM).

(ix) Write the procedure to convert unbalanced Transportation problem into Balanced.

(1)   (P.T.O.)

Q-3. Do as directed.

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

X:	1	2	3	4	5	6
Y:	1	4	9	16	25	36

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

class	118-126	127-135	136-144	145-153	154-162
Frequency	5	7	9	12	7

OR

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

class	118-126	127-135	136-144	145-153	154-162
Frequency	5	7	9	12	7

Q-4. Do as directed.

A. Explain the classification of Time Series movements. **[6]**

The following table gives the average yearly production of coal, in thousands of tons, in India for the years 2011-2017. Construct a 3 year moving average.

Year	2011	2022	2013	2014	2015	2016	2017
Production of steel	110	127	123	134	137	145	180

B. Write a program / an algorithm to find the equation of a least square line by considering Y **[6]** as dependent variable and X as independent variable.

OR

B. Prove that for linear regression the coefficient of correlation between the variables X and Y can be written as

$$r = \frac{\Sigma xy}{\sqrt{(\Sigma x^2)(\Sigma y^2)}}$$

Q-5. Do as directed.

A. There are five jobs each of which must go through the two machines A and B in the **[6]** order AB. Processing times are as follow. Determine a sequence for five jobs that will minimize the total elapsed time. Also find the total elapsed time and ideal time of each machine.

JOB	1	2	3	4	5
Machine A	12	4	20	14	22
Machine B	6	14	16	18	10

B. Explain with example(s) the steps to convert General Linear Programming Problem (LPP) **[6]** into standard LPP.

OR

B. Solve the following LPP using graphical method or simplex method. **[6]**

Max Z = 3 X1 + 5 X2

X1 + 2 X2 <= 2000

X1 + X2 <= 1500

X2 <= 600

& X1, X2, >=0

(2)

Q-6. Do as directed.

A. Determine the initial basic feasible solution using Lowest Cost Entry method and Vogel's Approximation Method for the following Transportation problem. **[6]**

Warehouse/ Factory	W1	W2	W3	W4	Available
F1	(19)	(30)	(50)	(10)	7
F2	(70)	(30)	(40)	(60)	9
F3	(40)	(8)	(70)	(20)	18
Requirements	5	8	7	14	

B. Do as directed. **[6]**

(i) Write short note on Dynamic programming approach. Also State the principal of Optimality given by Bellman..

(ii) Write the procedure to remove degeneracy in Transportation problem.

OR

B. Do as directed: **[6]**

(i) Formulate the problem as Linear Programming Problem.

A firm manufactures two types of products A and B and sells at a profit of Rs. 2 and Rs. 3 respectively. Each product is processed on 2 machines C and D. Type A requires 1 minute of processing time on C and 2 minutes of processing time on D; type B requires 1 minute on C and 1 minute on D. The machine C is available for not more than 6 hours 40 minutes while D is for 10 hours during any working day.

(ii) Write short note on sensitivity analysis.

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