

(35)

**SARDAR PATEL UNIVERSITY**  
**MCA SECOND SEMESTER EXAMINATIONS - 2019**  
**PS02FMCA21: Statistical and Optimization Techniques**  
 4<sup>th</sup> 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) Which of the following is not based on all the observations?  
 (a) Arithmetic mean (b) Geometric mean  
 (c) Median (d) Mode
- (ii) The standard deviation of a sample of 100 observations equals 64. The variance of the sample equals  
 (a) 8 (b) 4096  
 (c) 6400 (d) 10000
- (iii) To find the average speed of a journey, which of the following is more appropriate measure of central tendency?  
 (a) Arithmetic mean (b) Geometric mean  
 (c) Median (d) Harmonic mean
- (iv) The increase of departmental store sales during Christmas is an example of \_\_\_\_\_ movements of time series.  
 (a) Seasonal (b) Cyclic (c) Random (d) None of these
- (v) In transportation problem, a feasible solution to m-origin, n-destination problem is said to be non-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) a or b
- (vi) In simplex procedure if all  $\Delta_j \geq 0$  then the solution under test is/has \_\_\_\_\_ solution.  
 (a) optimal (b) Alternate (c) Unbounded (d) None of given
- (vii) In the graphical procedure, if the inequality-constraint corresponding to that line is  $\geq$ , then the region \_\_\_\_\_ the line lying in the first quadrant is shaded.  
 (a) above (b) below (c) on (d) None of given
- (viii) While finding optimal solution of a transportation problem, if all  $d_{ij}$  are non-negative then solution under test \_\_\_\_\_.  
 (a) Is Optimal (b) is not optimal (c) has alternate solution (d) None of given

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

[14]

- (i) Explain the steps to draw frequency polygon with example.  
 (ii) A car travels 25 miles at 25 miles per hour, 25 miles at 50 miles per hour and 25 miles at 75 miles per hour. Find the average speed of the car.
- (iii) Write the empirical relations between measures of dispersion.
- (iv) Write the differences between Seasonal movements and Irregular movements in time-series analysis.
- (v) **Formulate** the following problem as **Linear Programming Problem(LPP)**.  
 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 M and N. Type A requires 1 minute of processing time on M and 2 minutes of processing time on N; type B requires 1 minute on M and 1 minute on N. The machine M is available for not more than 8 hours 40 minutes while N is for 11 hours during any working day.
- (vi) When can you say that there is degeneracy in LPP?
- (vii) Define unbalanced Assignment Problem. How to convert it into Balanced?
- (viii) State the Principal of Optimality given by Bellman.
- (ix) Define the Degeneracy in Transportation Problem.

**Q-3. Do as directed.**

- A. Fit the least-square line to the data given in below table, by considering Y as dependent variable and calculate the value of Y when X = 7. [6]

<b>X:</b>	1	2	3	4	5	6
<b>Y:</b>	2	5	10	17	26	37

- B. The table given below shows the distribution of the maximum loads in tons supported by certain cables produced by a company. Find Arithmetic Mean, Median and Mode for the same: [6]

Maximum Load (in tons)	9.3-9.7	9.8-10.2	10.3-10.7	10.8-11.2	11.3-11.7	11.8-12.2
No. of Cables	2	6	12	18	14	8

**OR**

- B. The table given below shows the distribution of the maximum loads in tons supported by certain cables produced by a company. Find Mean deviation and Standard deviation for the same: [6]

Maximum Load (in tons)	9.3-9.7	9.8-10.2	10.3-10.7	10.8-11.2	11.3-11.7	11.8-12.2
No. of Cables	2	6	12	18	14	8

**Q-4. Do as directed.**

- A. Explain in brief, methods for estimation of trends. [6]

Find the moving average of order 4 for the following set of observations:

2, 6, 1, 5, 3, 7, 2, 4 and 6

- B. Write a Program / an algorithm to find the Median of a given frequency distribution. [6]

**OR**

- B. Prove that  $\sum(Y - \bar{Y})^2 = \sum(Y - Y_{est})^2 + \sum(Y_{est} - \bar{Y})^2$  [6]

**Q-5. Do as directed.**

- A. Find the optimum solution for the following Assignment Problem. [6]

	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>I</b>	10	5	13	15	16
<b>II</b>	3	9	18	13	6
<b>III</b>	10	7	2	2	2
<b>IV</b>	7	11	9	7	12
<b>V</b>	7	9	10	4	12

- B. Solve the following LPP using Simplex method. [6]

$$\text{Max } Z = 3X_1 + 5X_2 + 4X_3$$

$$2X_1 + 3X_2 \leq 8$$

$$2X_2 + 5X_3 \leq 10$$

$$3X_1 + 2X_2 + 4X_3 \leq 15$$

$$\& X_1, X_2, X_3 \geq 0$$

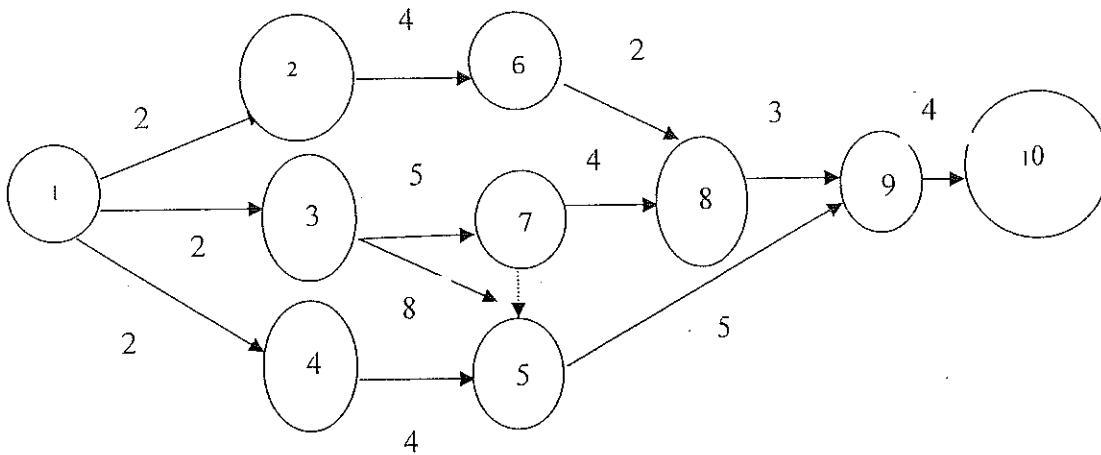
**OR**

- B. Write the steps to remove degeneracy in  
 (i) Transportation problem and  
 (ii) Linear Programming Problem [6]

Q-6. Do as directed.

A. Find the Critical Path for the given network diagram.

[6]



B. There are five jobs each of which must go through the two machines A and B in the 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 total ideal time of both machines.

[6]

JOB	1	2	3	4	5
Machine A	5	1	9	3	10
Machine B	2	6	7	8	4

OR

B. Do as directed.

[6]

- (i) State the conditions to solve n jobs 3 machines problem through Johnson method; used to solve n jobs 2 machines problem for job sequencing.
- (ii) Write the steps to convert General LPP into Standard LPP. Also explain each step with example.

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