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SARDAR PATEL UNIVERSITY
T.Y.B.C.A. (SEM-V) EXAMINATION November– 2019
US05FBCA01 : Operations Research

Date:11/11/2019 , Monday   Time: 10-00 to 01-00   **Total Marks : 70**

Q.1 Multiple choice questions: [10]

1   In graphical method the restriction on number of constraint is _____.
    [a] 2   [b] 3   [c] not more than 3   [d] none of these

2   Graphical optimal value for Z can be obtained from
    [a] Corner points of feasible region   [b] corner points of the solution region
    [c] Both a and c   [d] none of the above

3   The linear function of variables which is to be maximized or minimized is called _____
    [a] constraints   [b] basic requirements
    [c] objective function   [d] none of them

4   In the simplex method for solving of LPP number of variables can be _____.
    [a] Not more than three   [b] at least three
    [c] at least two   [d] none of them

5   The _____ variable is added to the constraint of less than equal to type.
    [a] slack   [b] Surplus   [c] artificial   [d] basic

6   The coefficient of artificial variable in the objective function is _____.
    [a] -M   [b] +M   [c] 0   [d] none of them

7   The Penalty in VAM represents difference between _____ cost of respective row/column.
    (a) Two Largest   (b) smallest two
    (c) largest and smallest   (d) none of them

8   If number of sources is not equal to number of destination in Assignment problem then it is called _____.
    [a] unbalanced   [b]symmetric   [c] unsymmetric   [d] balanced

9   Merge event represents _____ of two or more events.
    [a] beginning   [b]completion   [c] splitting   [d] none of them

10 Activity which is completed before starting new activity is called_____.
    [a] dummy   [b]Predecessor   [c] successor   [d] none of them

Q.2 Attempt any ten out of twelve. [20]
1. Define Operation research.
2. Define i] Unbounded solution ii] Optimum solution
3. Give any four models of operations research.
4. Write the standard form of LPP for the following LPP:

$$M \, ax \, im \, ize \; Z = 13x_1 + 25x_2$$
$$Subject \, to \; 21x_1 + 3x_2 \leq 40, \quad 5x_1 + 2x_2 \leq 7, \quad x_1, x_2 \geq 0$$

5. What is the condition for optimality in simplex table ?
6. What is the condition for entering variable in simplex table ?
7. What is travelling salesman problem?
8. What is feasible solution and non degenerate solution in transportation problem?
9. What is the Assignment problem?
10. Define two types of events used in network analysis.
11. Define successor and predecessor activity.
12. In brief explain problem of sequencing.

Q.3 (a) Note down the applications of operations research. [4]
Q.3 (b) Solve the following LPP by Graphical method. [6]
Maximize $Z = 40x_1 + 30x_2$
Subject to $3x_1 + 12x_2 \leq 30$
$x_1 \leq 8, x_2 \leq 12$
$x_1, x_2 \geq 0$

OR

Q.3 (a) Formulate the below problem. [4]
A firm manufactures two types of products A and B and sells them at a profit of Rs. 200 on type A and Rs. 300 on type B. each product is processed on two machines G and H. type A requires 1 minute of processing time on G and 2minutes on H; Type B requires 1 minute on G and 1 minute on H. the machine G is available for not more than 6 hours, 40 minutes while H is available for 10 hours during any working day. Formulate this problem as a linear programming problem.

Q.3 (b) Solve the following LPP by Graphical method. [6]
Maximize $Z = 25x_1 + 20x_2$
Subject to $16x_1 + 12x_2 \leq 100$
$8x_1 + 16x_2 \leq 80$
$x_2 \geq 2, x_1, x_2 \geq 0$

Q.4 (a) Define slack and surplus variable [3]
Q.4 (b) Solve the following LPP using simplex method. [7]
Maximize $Z = 12x_1 + 16x_2$
Subject to $10x_1 + 20x_2 \leq 120$
$8x_1 + 8x_2 \leq 80$
$x_1, x_2 \geq 0$

OR

Q.4 (a) Define artificial variable. [3]

Q.4 (b) Solve the following LPP using Big-M method. [7]

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \geq 2$

$x_1 + 3x_2 \leq 3$

$x_1, x_2 \geq 0$

Q.5 (a) Solve below assignment problem for allocating job to employee. [6]

Cost matrix

Jobs	Employee				
	A	B	C	D	E
1	9	3	10	13	4
2	9	17	13	20	5
3	5	14	8	11	6
4	11	13	9	12	3
5	12	8	14	16	7

Q.5 (b) Solve below transportation problem using North West Corner Method [4]

From	To				Supply
	City-1	City-2	City-3	City-4	
Plant-1	8	6	10	9	35
Plant-2	9	12	13	7	50
Plant-3	14	9	16	5	40
Demand	45	20	30	30	

OR

Q.5 (a) Solve below transportation method using vogel's approximation method. [6]

Origin	Destination				
	A	B	C	D	Supply
1	20	22	17	4	120
2	24	37	9	7	70
3	32	37	20	15	50
Demand	60	40	30	110	240

Q.5 (b) Write an algorithm for solve the assignment problem [4]

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(PTO)

Q.6(a) In a machine shop 6 different products are being manufactured each requiring time on [6]
two different machines A and B are given in the table below:

Product	1	2	3	4	5	6
Machine-A	30	120	50	20	90	110
Machine B	80	100	90	60	30	80

Find an optimal sequence of processing of different product in order to minimize the
total manufctured time for all product. Find total ideal time for two machines and
elapsed time.

Q.6(b) Find the critical path and calculate the earliest and latest time for the following PERT [4]
diagram.
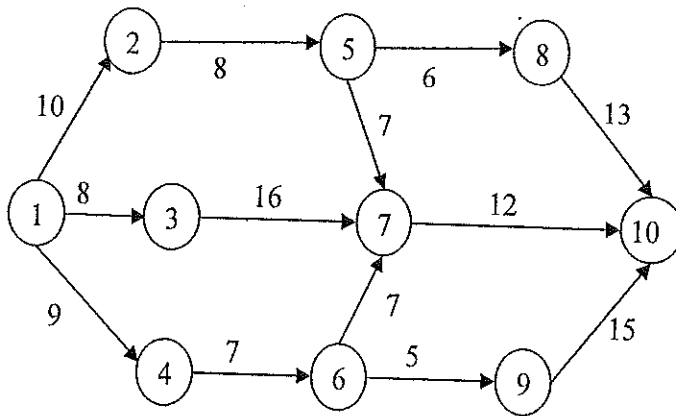
OR

Q.6(a) A small maintenance project consists of the following 12 jobs [6]

Jobs	Duration in days	Jobs	Duration in days	Jobs	Duration in days
1-2	2	3-6	1	6-9	3
1-4	2	4-5	5	7-8	3
1-7	1	4-8	8	8-9	5
2-3	4	5-6	4		

Draw the arrow network of the project. Determine the critical path.

Q.6(b) Explain sequencing problem and the method for solve it. [4]

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