SARDAR PATEL UNIVERSITY

T.Y.B.C.A. Exam: Fifth Semester (NC)

Operations Research: US05FBCA01

Date: 09/05/2016, Monday

Time: 10.30 am to 1.30 pm

Total marks: 70

Q-1 Choose the appropriate answer from the options given below [10]

1. The linear function in LPP which is to be maximized or minimized is called _____ .

   [a] constraints   [b]basic requirements

   [c] objective function   [d] none of them

2. In graphical method the restriction on number of constraint is _____ .

   [a] 2   [b] 3   [c] not more than 3   [d] none of them

3. In the definition of LPP where m stands for number of constraints and n for number of variables, then which of the following relations hold

   $[a] m = n$ $[b] m \leq n$ $[c] m \geq n$ [d] none of them

4. The coefficient of slack variable in the objective function is _____ .

   [a] -M   [b] +M   [c] 0   [d] none of them

5. For the constraint of greater than equal to type we make use of _____ variable.

   [a] slack   [b] Surplus   [c] artificial   [d] basic

6. North – West corner in transportation problem refers to _____ .

   [a] top left corner   [b] top right corner

   [c] bottom left corner   [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. In Assignment Problem the value of decision variable x_{ij} is____ .

   [a] no restriction   [b] two or one   [c] one or zero   [d] none of them

9. Processing time M_{ij}'s are _____ of order of processing the jobs.

   [a] dependent   [b] independent   [c] negligible   [d] none of them.

10. Activity which starts only after finishing other activity is called _____ .

    [a] dummy   [b]predecessor   [c] successor   [d] merge

Q-2 Answer briefly. (Attempt any ten) [20]

1. Define i] Solution   ii] Basic solution in LPP.

2. State phases of formulating the problem.

3. What is unbalanced transportation problem?

4. Give any four models of operations research.

5. Write mathematical form of Assignment problem?

6. What is travelling salesman problem?

7. What is the condition for optimality in simplex table ?

8. What is dynamic Programming?

9. Define surplus variables with example.

(PTO)

10. Write the standard form of LPP for the following LPP:

Maximize $Z = 3x_1 + 5x_2$

Subject to $21x_1 + 3x_2 \leq 40$, $5x_1 + 2x_2 \leq 7$, $x_1, x_2 \geq 0$

11. What are the assumption for sequencing?

12. Write about different types of events in network.

Q-3 (a) Note down the applications of operations research. [04]

(b) A firm can produce two types of cloth, say: A and B. Three kinds of wool [06] are required for it, say : red, green and blue wool. One unit length of type A cloth needs 4 meters of red wool and 3 meters of green wool; whereas one unit length of type B cloth needs 3 meters of red wool, 2 meters of green wool and 5 meters of blue wool. The firm has only a stock of 10 meters of red wool, 6 meters of green wool and 15 meters of blue wool. It is assumed that the profit obtained from one unit length type A cloth is Rs. 13 and of type B cloth is Rs. 25. Formulate as LPP.

OR

Q-3(c) Solve the following LPP using graphical method. [05]

Maximize $Z = 6x_1 + 8x_2$

Subject to $5x_1 + 10x_2 \leq 60$,

$4x_1 + 4x_2 \leq 40$,

$x_1, x_2 \geq 0$

(d) A manufacturer has two machines A and B. He manufactures two [05] products P and Q on these two machines. For manufacturing product P he has to use machine A for 3 hours and machine B for 6 hours, and for manufacturing product Q he has to use machine A for 6 hours and machine B for 5 hours. On each unit of P he earns Rs. 14 and on each unit of Q he earns Rs. 10. How many units of P and Q should be manufactured to get the maximum profit? Each machine cannot be used for more than 2100 hours. Formulate as LPP.

Q4 Maximize $Z = 3x_1 + 4x_2$ [10]

Subject to $x_1 + x_2 \leq 6$, $2x_1 + 4x_2 \leq 20$, $x_1, x_2 \geq 0$

Solve the above LPP using simplex method.

OR

Q4 (a) Solve the following LPP for optimal solution using Big M method. [06]

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \geq 2$, $x_1 + 3x_2 \leq 3$, $x_1, x_2 \geq 0$

(b) Solve the following LPP using Simplex method. [04]

Maximize $Z = 3x_1 + 5x_2$

Subject to $x_1 + x_2 \leq 4$, $3x_1 + 2x_2 \leq 18$, $x_1, x_2 \geq 0$

Q-5(a) Obtain the optimal solution to Transportation Problem given below. [10]

Plants	Destinations				Supply
	A	B	C	D	
P$_1$	19	30	50	10	7
P$_2$	70	30	40	60	9
P$_3$	40	8	70	20	18
Demand	5	8	7	14	

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Q-5 (a) Obtain the initial solution to above TP using north west corner method. [04]

Source	Destination			
	a	b	c	Supply
I	10	9	8	8
II	10	7	10	7
III	11	9	7	9
IV	12	14	10	4
Demand	10	10	8	

(b) Solve the assignment problem so as to minimize the total time. [06]

Time required by each person for each project

Person	Projects			
	1	2	3	4
A	11	10	18	5
B	14	13	12	19
C	5	3	4	2
D	15	18	17	9

Q-6 (a) In a machine shop 8 different products are being manufactured each requiring time on two different machines A and B are given in the table below: [06]

Product	1	2	3	4	5	6	7	8
Machine-A	30	45	15	20	80	120	65	10
Machine B	20	30	50	35	35	40	50	20

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.

(b) State the rules for drawing network diagram. [04]

Q-6 A small maintenance project consists of the following 12 jobs [10]

Jobs	Duration in days	Jobs	Duration in days	Jobs	Duration in days
1-2	2	3-5	5	6-10	4
2-3	7	4-6	3	7-9	4
2-4	3	5-8	5	8-9	1
3-4	3	6-7	8	9-10	7

Draw the arrow network of the project. Determine the critical path. Also obtain total float, independent float and free float.

All the Best

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