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SARDAR PATEL UNIVERSITY, VALLABH VIDYANAGAR

On Demand External Examination (NC) -2022

BCA Semester V

Subject: Operational Research (US05FBCA01)

TIME: 10:00AM TO 12.00 PM **DATE: 06/07/2022** **MARKS: 70**

Q.1 Multiple Choice Questions **[10]**

1 Operation research approach is

(i) Multi-disciplinary (ii)Artificial (iii) Intuitive (iv) All

2 Operation research analysis does not

(i) Predict future operation (ii)Build more than one model (iii) Collect the relevant data (iv) Recommende decision and accept

3 A constraint in an LP model restricts

(i) value of the objective function (ii)value of the decision variable (iii) use of the available resources (iv) All

4 In graphical method of linear programming problem if the ios-cost line coincide with a side of region of basic feasible solutions we get

(i) Unique optimum solution (ii)unbounded optimum solution (iii) no feasible solution (iv) Infinite numb of optimum solutions

5 The role of artificial variables in the simplex method is

(i) to aid in finding an initial solution (ii) to find optimal dual prices in the final simplex table. (iii) to start with Big M method. (iv) All

6 For a maximization problem, the objective function coefficient for an artificial variable is

(i) + M (ii) -M (iii) Zero (iv)None

7 For maximization LPP, the simplex method is terminated when all values

(i) $cj - zj \leq 0$ (ii) $cj - zj \geq 0$ (iii) $cj - zj = 0$ (iv) $zj \leq 0$

8 If any value in b - column of final simplex table is negative, then the solution is

(i)unbounded (ii) infeasible (iii) optimal (iv)None

9 The initial solution of a transportation problem can be obtained by applying any known method. However, the only condition is that

(i) the solution be optimal (ii) the rim condition are satisfied. (iii) the solution not be degenerate. (iv) all

10 The dummy source or destination in a transportation problem is added to

(i) satisfy rim condition. (ii) prevent solution from becoming degenerate. (iii) ensure that total cost does not exceed a limit. (iv) all

Q.2 Fill in the Blanks and True or False **[08]**

1 The solution to a transportation problem with m-rows and n-columns is feasible if number of positive allocations are _____.

2 The method used for solving an assignment problem is called _____.

3 The slack for an activity is equal to_____.

4 A constraint in an LP model restricts_____.

5 A feasible solution of LPP must satisfy all the conditions. State True / False

6 The objective function for a L.P model is $3x_1+2x_2$, if $x_1=20$ and $x_2=30$, what is the value of the objective function 120. State True / False

7 Maximization of objective function in LPP means highest value is chosen among allowable decision. State True /False

8 Linear programming problem involving only two variables can be solved by Graphical Method. State True / False

Q.3 **Short Questions (Write Any 10 out of 12)** **[20]**

1 Write the definition of operation research.
2 Write the definition of solution, basic solution.
3 What is Linear programming problem?
4 What is the criterion for the entering variable and outgoing variable?
5 What is Replacement ratio while solving LPP by Simplex method
6 What is the criterion for test of optimality?
7 What is Transportation problem?
8 State the mathematical formulation for T.P.
9 What is an Assignment Problem?
10 State Rules for Network Diagram.
11 What is Sequencing problems?
12 Write disadvantages of Network techniques.

Q.4 Long Questions Answers (Write four out of eight) **[32]**

1 A firm manufactures two products A and b on which the profits earned per unit are Rs 3 and Rs 4 respectively. Each product is processed on two machines M1 and M2. Product A requires one minute of processing time on M1 and two minutes on M2 while B requires one minute on M1 and one minute on M2. Machine M1 is available for not more than 7 hours, while machine M2 is available for 10 hours during any working day. Formulate the number of units of products A and B to be manufactured to get maximum profit.

2 The ABC Company has been a producer of picture tubes for television sets and certain printed circuits for radios. The company has just explained into full scale production and marketing of AM and AM-FM radios. It has built a new plant that can operate 48 hours per week. Production of an AM radio in the new plant will require 2 hours and production of an AM-FM radio will require 3 hours. Each AM radio will contribute Rs. 40 to profits while an AM-FM radio will contribute Rs. 80 to profits. The marketing departments, after extensive research, have determined that a maximum of 15 AM radios and 10 AM-FM radios can be sold each week. Formulate the LPP.

3 Solve the following LP problems graphically

1) Maximize $Z = 30\,x_1 + 20\,x_2$
s.t. $3\,x_1 + 3\,x_2 \geq 40$
$3\,x_1 + x_2 \geq 40$
$2\,x_1 + 5\,x_2 \geq 44$
$x_1\,,\ x_2 \geq 0$

4 Solve the following LP problems graphically

2) Minimize $Z = 3\,x_1 + 2\,x_2$
s.t. $5\,x_1 + x_2 \geq 10$
$x_1 + x_2 \geq 6$
$x_1 + 4\,x_2 \geq 12$
$x_1\,,\ x_2 \geq 0$

5 Three fertilizers factories X, Y and Z located at different places of the country produce 6, 4 and 5 lakh tones of urea respectively. Under the directive of the central government, they are to be distributed to 3 States A, B and C as 5, 3 and 7 lakh respectively. The transportation cost per tones in rupees is given below:

	A	B	C
X	11	17	16
Y	15	12	14
Z	20	12	15

Find out suitable transportation pattern at minimum cost by North West Corner method and Least Cost method.

6 Determine an IBFS by Vogel's Approximation method.

Source	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

7 A project has the following time Schedule. Construct a PERT network and compute Critical Path and its duration. Also calculate Total float, Free float.

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6
Time in Weeks	4	1	1	1	6	5	4
Activity	5-7	6-8	7-8	8-9	8-10	9-10	
Time in Weeks	8	1	2	1	8	7	

8 A project schedule has the following characteristics. Construct the PERT network and find the critical path and time duration of the project.

Activity	1 - 2	1 - 4	1 - 7	2 - 3	3 - 6	4 - 5	4 - 8	5 - 6	6 - 9
Time	2	2	1	4	1	5	8	4	3