SEAT No._____ No. of Printed Pages: 2

[20]

SARDAR PATEL UNIVERSITY
B.Sc.(Semester-III)EXAMINATION (NC)
January 02, 2021, Saturday
10:00 a.m. to 12:00 noon
US03EMTH06(MATHEMATICS)
(Operation Research-I)

Maximum Marks: 70

Q.1 Choose the correct option in the following questions, mention the correct option in the answerbook. [10]

(1) In the simplex method the variable enters in the basis if
(a) $z_j - c_j \leq 0$ (b) $z_j - c_j \geq 0$ (c) $z_j - c_j = 0$ (d) $z_j - c_j < 0$

(2) Minimize Z=.....
(a) -Maximize(Z) (b) Maximize(Z) (c) -Maximize(-Z) (d) none of these

(3) In graphical method of solving LPP, the restriction on number of constraint is.....
(a) 2 (b) 3 (c) not more than 3 (d) none of these

(4) Feasible solution satisfies.....
(a) only constraints (b) only non-negative restriction (c) (a) and (b) both (d) (a), (b) and optimum solution

(5) 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

(6) The Penalty in VAM represents difference between.....cost of row/column.
(a) two largest (b) two smallest (c) largest and smallest (d) none of these

(7) The.....variable is added to the constraint of less than equal to type.
(a) slack (b) Surplus (c) artificial (d) basic

(8) The optimum solution of a transportation problem can be obtained by.....method.
(a) Hungarian (b) North-west corner (c) Big-M (d) Modified distribution

(9) The coefficient of slack variable in the objective function is
(a) $-M$ (b) M (c) 0 (d) none of these

(10) From the following methods which is a method to obtain initial solution to T.P.
(a) Hungarian (b) Simplex (c) North-West (d) Newton Raphson

Q.2 Do as directed: [08]

(1) Operations research is the application of.....methods to arrive at the optimal solutions to the problems.

(2) The solution to LPP give below is,
$MaximizeZ = 30x_1 - 15x_2$,
subject to: $2x_1 - 2x_2 \leq 2$, $-2x_1 + 2x_2 \leq 2$, $x_1 \geq 0$, $x_2 \geq 0$.

(3) The.....variable is added to the constraint of greater than equal to type.

(4) The Penalty in VAM represents difference between.....cost of row/column.

(5) In Transportation problem the preferred method of obtaining either optimal or very close to the optimal solution is.....

(6) True or False: Simplex method is a method to obtain initial solution to T.P.

(7) True or False: North - West corner refers to top left corner.

(8) True or False: For a minimization problem, the objective function coefficient for an artificial variable is $+M$.

Q.3 Attempt any Ten: [20]

(1) What is unbalanced Transportation Problem? How to convert it into balanced one.

(2) Define feasible solution.

(3) Express the following LPP in standard form:
$MaximizeZ = x_1 + 11x_2 + 6x_3$
subject to: $2x_1 + x_2 + x_3 \leq 2$, $6x_1 + 5x_2 \leq 12$, $4x_1 + x_3 \leq 5$, $x_3 \leq 11$, $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$.

(4) Define slack and surplus variable.

(5) Why Vogel's Approximation method is considered to be the best method for obtaining initial basic feasible solution?

[P.T.O.]

(6) Find dual of the following LPP:
$Maximize Z = 3x_1 + 5x_2$
subject to: $3x_1 + 2x_2 \leq 18,\ x_1 \leq 4,\ x_2 \leq 6,\ x_1 \geq 0,\ x_2 \geq 0.$

(7) What do you mean by balanced transportation problem?

(8) Write the computational steps of Big-M method.

(9) Give the algorithm of LCM to obtain basic feasible initial solution to transportation problem.

(10) Define linear programming problem.

(11) State two condition of optimality test for TP.

(12) Describe the standard form of LPP.

Q.4 Attempt any Four: [32]

(a) Solve the following LPP using Graphical method:
$Maximize Z = 8000x_1 + 7000x_2$
subject to: $3x_1 + x_2 \leq 66,\ x_1 + x_2 \leq 45,\ x_1 \leq 20,\ x_2 \leq 40,\ x_1 \geq 0,\ x_2 \geq 0.$

(b) A firm manufactures 3 products A, B and C. The profit are Rs. 3, Rs. 2 and Rs. 4 respectively. the firm has 2 machines and below is the required processing time in minutes for each machine on each product.Machine G and H have 2000 and 2500 machine minutes respectively. The firm must manufacture 100 A's, 200 B's and 50 C's, but no more than 150 A's. Formulate as LPP.

(c) Solve the following LPP using Simplex method: $Maximize Z = 5x_1 + 7x_2$
subject to: $4x_1 + 5x_2 \leq 200,\ 3x_1 + 5x_2 \leq 180,\ 2x_1 + 3x_2 \leq 165,\ x_1 \geq 0,\ x_2 \geq 0.$

(d) Solve the following LPP using Big-M method:$Maximize Z = -2x_1 - x_2$
subject to: $3x_1 + x_2 = 3,\ 4x_1 + 3x_2 \geq 6,\ x_1 + 2x_2 \leq 4,\ x_1 \geq 0,\ x_2 \geq 0.$

(e) Obtain an initial basic feasible solution of the following Transportation Problem using column minima.

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	

(f) Obtain an initial basic feasible solution of the following Transportation Problem using Vogel's approximation method.

	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	

(g) Obtain the Optimum solution of the following Transportation Problem

	D_1	D_2	D_3	D_4	Supply
O_1	1	2	1	4	30
O_2	3	3	2	1	50
O_3	4	2	5	9	20
Demand	20	40	30	10	

(h) Obtain the Optimum solution of the following Transportation Problem

	D_1	D_2	D_3	D_4	Supply
O_1	19	30	50	10	7
O_2	70	30	40	60	9
O_3	40	8	70	20	18
Demand	5	8	7	14	

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