UNIVERSITY OF GUJRAT

A WORLD CLASS UNIVERSITY

(M.A/M.Sc Part-II)

(Mathematics) Operations Research

Roll No: _____

in words: _____

Cutting, Overwriting, Erasing, Fluid painting and use of Lead Pencil will earn no marks. Write answer of the Question No.1 and 2 on this sheet and handover it to the supervisory staff of examination within first 35 minutes.

Time Allowed: 35 Minutes ***(OBJECTIVE PART)*** ***Max. Marks: 32***

Sign of Supdt. _____

1- a) Encircle the correct answer: *1x4*

i) The function to be minimized or maximized is called:

a) Constant function b) Objective function c) Linear function d) None

ii) Multiplier method is used to obtain _____ solutions of transportation problem.

a) Starting b) Optimum c) Trivial d) Non-Trivial

iii) Constraint coefficients of primal variable form _____ coefficient of corresponding dual.

a) L.H.S b) R.H.S c) Negative d) Positive

iv) The process of finding entering variable is called

a) Feasibility Condition b) Optimality Condition

c) North West Corner Method d) Least Cost Method

b) Encircle True or False: *1x8*

i) If primal has degenerate optimal solution then dual has non-degenerate optimal solution. **TRUE / FALSE**

ii) In simplex method, optimum is reached when all Z-row coefficients of non-basic variables are non-positive in maximization. **TRUE / FALSE**

iii) Un-knowns determined from the solution of a model are called decision variables. **TRUE / FALSE**

iv) A basic solution in which all the basic variables are less than or equal to zero is called a basic feasible solution. **TRUE / FALSE**

v) The fractional cut method is used for integer linear programming. **TRUE / FALSE**

vi) In dual simplex method, the leaving variable has the most positive value. **TRUE / FALSE**

vii) Pivot Equation: New Pivot Equation = Current Pivot ÷ Pivot Element **TRUE / FALSE**

viii) Transport to the desired places at least cost in order to fulfill the demand is called transportation. **TRUE / FALSE**

c) Fill in the blanks meaningfully: *1x4*

i) When the total supply equal to the total demand, the resulting formulation model is called_____.

ii) In LP model, if all constraints are not of the type ≤ then this special case is called_____.

iii) A spanning tree is a connected network that includes all the nodes in the network with_____.

iv) A dual variable corresponding to an equality constraint in primal is _____ in sign.

(Continued Overleaf)

2- Give short answers of the following questions: *2x8*

i) What is an Unbounded Solution and how is it identified in a simplex method?

ii) State the basic difference between North West Corner Method and VAM in solving a transportation problem?

iii) With reference to Simplex Table, when does an alternate optimal solution exist?

iv) What is Feasibility Condition in Dual Simplex Method?

v) What are the THREE Basic Elements of Linear Programming Problem?

vi) Describe Shortest Route Problem?

vii) Define Surplus / Slack Variables.

viii) Write a note on M-Technique Method.

Total Marks: 68 + 32 = 100
Pass Marks: 40%

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Time Allowed : 2:25 hrs
Max. Marks : 68

Attempt **FOUR** Questions in all. Select **TWO** Questions from **Section A** and **TWO** Questions from **Section B.** All Questions carry equal marks.

SUBJECTIVE PART

SECTION-I

3- Electra produces two types of electric motors, each on a separate assembly line. The respective daily capacities of the two lines are 600 and 750 motors. Type 1 motor uses 10 units of a certain electronic component, and type 2 motor uses only 8 units. The supplier of the components can provide 8000 pieces a day. The profit for motor 1 and 2 are $60 and $40 respectively.

a) Determine the optimum daily production mix.

b) Determine the optimality range of unit profits that will keep the solution in (a) unchanged. *9,8*

4- a) Solve L-P Model using M-Technique *9,8*

Min $z = 4x_1 + x_2$

Subject to
$3x_1 + x_2 = 3$
$4x_1 + 3x_2 \geq 6$
$x_1 + 2x_2 \leq 4$
$x_1, x_2 \geq 0$

b) Solve by Dual Simplex Method

Maximize $z = -3x_1 - 2x_2$

Subject to
$x_1 + x_2 \geq 1$
$x_1 + x_2 \leq 7$
$x_1 + 2x_2 \geq 10$
$x_2 \leq 3$
$x_1, x_2 \geq 0$

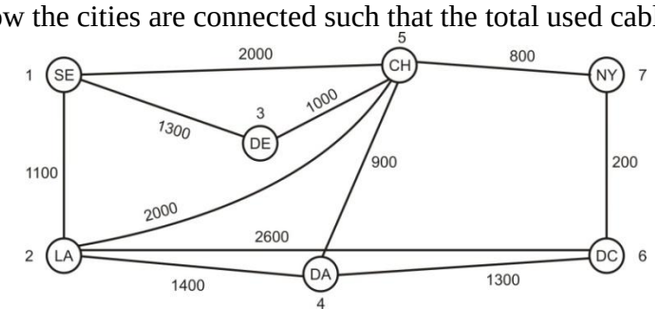
5- Solve the following by mixed cut algorithm: *17*

Maximize $z = 4x_1 + 6x_2 + 2x_3$

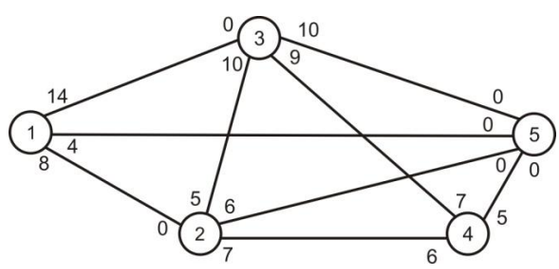
Subject to
$4x_1 - 4x_2 \leq 5$
$-x_1 + 6x_2 \leq 5$
$-x_1 + x_2 + x_3 \leq 5$
$x_1, x_2, x_3 \geq 0$ x_1, x_3 are integers.

SECTION-II

6- a) Suppose that it is desired to establish a cable communication network that links the major cities shown in the figure. Determine how the cities are connected such that the total used cable mileage is minimized. *17*



b) Determine the maximal flow of the following network:



(Continued Overleaf)

7- In the transportation model, using VAM method to find the starting solution, then determine the optimum solution *9,8*

	1	2	3	4	Supply
1	10	20	5	7	10
2	13	9	12	8	20
3	4	15	7	9	30
4	14	7	1	0	40
5	3	12	5	19	50
Demand	60	60	20	10	

8- Solved problem as Transshipment Model and find optimal solution. *17*

Maximize $z = 4x_1 + 6x_2 + 2x_3$

S.t $4x_1 - 4x_2 \leq 5$

$-x_1 + 6x_2 \leq 5$

$-x_1 + x_2 + x_3 \leq 5$

x_1, x_2, x_3 are non- negative integers