Subject: Math: IV-VI(x)/IX-XI(x) M.A/M.Sc: Part- II / Composite, 1st -A/2011

Roll No. _____ Sig of Dy. Superintendent. _____

---------- Cut Here ----------

University of Sargodha

M.A/M.Sc Part-II / Composite, 1st -A/2011

Math: IV-VI(x)/IX-XI(x) Operations Research

Maximum Marks: 40 **Fictitious #:** _____

Time Allowed: 45 Min. ***Objective Part*** **Signature of CSO:** _____

Note: **Cutting, Erasing, overwriting and use of Lead Pencil are strictly prohibited. Only first attempt will be considered.**

Q1: (a) Fill in the following blanks **(10)**

i. The three basic components in an LP model are variables, objectives and _____.

ii. The constraints variables can 't assume negative values this restriction is called _____.

iii. *The study of the sensitivity of optimal solution is called* _____.

iv. In LP modal the amount by which left hand side exceeds the minimum limits represents _____.

v. Graphical solution of an LP modal solution space consists of _____ many feasible points.

vi. A resource is designated as _____ if the variables of the modal use the resource completely.

vii. If the objective function is parallel to the binding constraints, then the objective function will assume the value called _____ optima.

viii. A dual constraint is defined for each _____ variables.

ix. Transportation model can be converted to a regular transportation method by using the ideas of _____.

x. A _____ is a sequence of distinct arcs that join two nodes through other nodes regardless of the direction of flow in each arcs.

(b) Write true or false **(5)**

i. The feasible region may have negative values. **T/ F**

ii. The M-method is also called method of penalty. **T / F**

iii. Revised simplex method is better than simplex method. **T/ F**

iv. A dual constraint is also called basic constraint. **T / F**

v. The transshipment model recognizes that it may be cheaper to ship through the transient nodes before reaching the final destination. **T/ F**

(C) Select the correct answer **(5)**

i. Feasible solution space is said to form _____ set if line joining two distinct feasible points falls in the set.

(a) convex (b) concave (c) negative (d) positive

ii. The arcs represent the routes linking the source and the _____.

(a) lines (b) curves (c) destinations (d) result

iii. The relationship between the method of _____ and the simplex method can be explained on the primal dual relationship.

(a) multiplier (b) constant (c) variables (d) transshipment

iv. The optimum solution of a linear program is always associated with a _____ feasible solution.

(a) basic (b) non-basic (c) zero (d) non-zero

v. The transportation algorithm follows the exact steps of _____ method.
(a) M-method (b) Multiplier (c) Graphical (d) simplex

Q2. Write short answer of the following. **(20)**

1. Define pseudo-optimal solution for an LP model.
2. Explain dual optimality condition.
3. Explain the Northwest-Corner method.
4. Define a basic solution of a LP model.
5. Define pure and mixed integer program.
6. What is the logic of M-technique.
7. Define assignment model.
8. Define duality theorem.
9. Explain the term branching in integer programming.
10. Write a note on dual feasibility condition.

i. _____

_____

ii. _____

_____

iii. _____

_____

iv. _____

_____

v. _____

_____

vi. _____

_____

vii. _____

_____

viii. _____

_____

ix. _____

_____

x. _____

_____

Math: IV-VI(x)/IX-XI(x) Operations Research

Maximum Marks: 60 **Time Allowed: 2:15 Hours**

Subjective Part

Note: Attempt any five questions. All questions carry equal marks.

Q: 3. A company produces both interior and exterior paints from two raw materials M1 and M2 as given below: **Tons of raw material per ton of** **(12)**

	Exterior paint	Interior paint	Max. daily availability(tons)
Raw material M1	6	4	24
Raw material M2	1	2	6
Profit/ ton (Rs 1000)	5	1	

A market survey indicates that the daily demand for interior paint cannot exceed that of the exterior paint by more than one ton. Also, maximum daily demand of interior paint is 2 tons. Use graphical method to determine how the two products should be mixed to obtain the maximum daily profit.

Q: 4 Use Simplex method to minimize $z = 2x_1 - x_2 + 4x_3$ **(12)**

Subject to $5x_1 + 2x_2 - 3x_3 \geq -7$

$2x_1 - 2x_2 + 3_3 \leq 8$

$x_1 + 2x_2 \geq 4$ all variables are nonnegative

Q: 5 Use two-phase method solve the problem **(12)**

Minimize: $z = x_1 + 2x_2 + 3x_3$

Subject to: $x_1 - 2x_2 + x_3 \geq 1$

$3x_1 - 4x_2 + 6x_3 \leq 8$

$2x_1 - 4x_2 + 2x_3 \leq 2$ all variables are nonnegative

Q: 6 Use M-technique Minimize: $z = 10x_1 + 2x_2 - x_3$ **(12)**

Subject to: $x_1 + x_2 \leq 50$, $x_1 + x_2 \leq 10$

$x_2 + x_3 \leq 30$, $x_2 + x_3 \geq 7$ all variables are nonnegative

Q: 7 Solve the parametric linear programming **(12)**

Maximize: $z = (3+t)x_1 + (2+2t)x_2 + (5-t)x_3$

Subject to: $x_1 + 2x_2 + 2x_3 \leq 40$

$3x_1 + 2x_3 \leq 60$

$x_1 + 4x_2 \leq 30$ all variables are nonnegative

Q: 8 The optimal basis for the following LP is $B = (P_1, P_4)$, write the dual and find its optimal solution using the optimal primal basis. **(12)**

Maximize: $z = 3x_1 + 5x_2$

Subject to: $x_1 + 2x_2 + x_3 = 5$

$-x_1 + 3x_2 + 2x_4 = 2$ all variables are nonnegative

Q: 9 using branch and bound algorithm solve the following problem **(12)**

Maximize: $z = 3x_1 + 4x_2$

Subject to: $2x_1 + x_2 \leq 6$

$2x_1 + 3x_2 \leq 9$ $x_1 \leq 1, x_2 \geq 2$

Q: 10 A car rental company is faced with an allocation problem resulting from the rental agreements that allow cars to be returned to locations other than those at which they were originally rented. At the present time there are two locations with 15 and 13 surplus cars, respectively, and four locations requiring 9, 6, 7 and 9 cars resp. unit transformation costs between the locations are

	Dest. 1	Dest. 2	Dest.3	Dest. 4
Source 1	45	17	21	30
Source 2	14	18	19	31

(12)

Solve this transportation problem.