CAIRO UNIVERISITY

FACULTY OF SCIENCE

MATHEMATICS DEPARTMENT

جامعة القاهرة

Exam Midterm Math 493 (Operations research)
4^{th} year

Time allowed: 45 minutes

Date: 10-12-2020

Answer the following questions:

1) Consider the following (LP) problem:

$$\text{Maximize } Z=3x_1+x_2+5$$

Subject to:
$$x_1+x_2=3$$
$$x_1+3x_2\le 8$$
$$2x_1+x_2\le 3;\ x_1, x_2\ge 0$$

a) Solve the above (LP) problem by:

i) Graphical method and specify S, θ, θ_x and θ_μ. ii) Two-Phase technique.

b) Find redundant constraints and degenerate points of this (LP) problem.

c) Find the Dual problem of the (LP) problem after change x_2 by x_2 free.

2) a) prove that if a maximize (LP) problem in standard form has finite optimal solution then it has an extreme optimal point.

b) The following tableau represents a Minimize (LP) problem in standard form:

	X_1	X_2	X_3	X_4	X_5	Solution
Z-eqn.	0	b	e	0	0	−9
	1	c	1	0	0	a
	0	d	-1	1	0	2
	0	-1	1	0	1	4

Give conditions on the parameters a, b, c, d, and e so that:

$b, e \le 0$ 0, −ve ← ∃

i) The table is in optimal form. ii) The table is in unbounded form. → −ve, −ve, 0, −ve, 0, −ve, 0 $b<0$ $c, d\le 0$

$\exists\, c_i<0,\ a_{ik}\le 0$

iii) The table is in infeasible form (2).

−ve sol. صف كلو +ve و ال

Best Wishes

$c\ge 0$
$a<0$

$\exists\, b_i<0,\ a_{ik}\ge 0,\ \forall k\ge 0$

infeasible form(1)
0 | 0 | 0 | sol +ve
$\exists\, b_i\ne 0,\ a_{ik}=0\ \forall k_i$

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Math 493 (Operations research) 4^{th} years — Time allowed: 1Hr

2^{nd} Mid Term Exam — Date: 28-12-2020

Answer the following questions:

(1) Solve the following (ILP) problem by apply Gomory's cutting plane method

$$\text{Minimize} \quad Z = x_1 - 2x_2$$
$$\text{Subject to} \quad 2x_1 + x_2 \leq 5$$
$$-4x_1 + 4x_2 \leq 5$$
$$x_1, x_2 \geq 0 \text{ And integers}$$

The optimal continuous solution for given (ILP) problem is given by the table:

Basis	X_1	X_2	X_3	X_4	Solution
Z	0	0	-1/3	-5/12	-15/4
X_1	1	0	1/3	-1/12	5/4
X_2	0	1	1/3	1/6	5/2

(2) Solve the following (FLP) problem

$$\text{Max} \quad \frac{x_1 + 2x_2}{4x_1 + 3x_2 + 3}$$
$$\text{Subject to} \quad x_1 + x_2 \leq 2 \; ; \quad -x_1 + x_2 \leq 1$$
$$x_1, x_2 \geq 0$$

(3) Select (True) or (False) and correct the wrong answer for the following statements:

a. The dual simplex method solves any (LP) problem.

b. The feasible region of (ILP) problem is convex set. discrete

c. In (FLP) problem the objective function

$$w = \frac{p^t x + a}{q^t x + b} \; ;$$
$$(q^t x + b) > 0 \quad or \quad (q^t x + b) < 0$$
$$\forall x \in S$$

d. The feasible region of (FLP) problem is discrete set. Linear

e. The variables in (ILP) problem are non-negative and integers.

Best Wishes