PRINCE SULTAN UNIVERSITY

MATH 101 FINITE MATH

MAJOR EXAM 2 9th MAY 2010

Start : 4:00 pm
End: 6:00 pm

Name: _____

I.D. _____

Time : Circle One (9 a.m.) (10 a.m.) (11 a.m.)

1. Answer all questions.
2. This exam consists of 1 Cover Sheet & 6 Question Sheets with 12 questions.
3. You can use a calculator, **NOT** a mobile phone.
4. No talking during the test.
5. Show all working out in the space provided.

Question No.	Max. Points	Points Scored
1,2	**14**	
3,4	**10**	
5	**10**	
6	**12**	
7	**12**	
8,9,10,11,12	**22**	
TOTAL	**80**	

1) [6 points] Graph the solution set of the following system of inequalities

$$-3x + 4y \geq -24$$
$$x + y \geq 8$$
$$3 \leq y < 8$$

2) [8 points] A manufacturing company produces two types of washing machines- a top loading model and a front loading model.
In the manufacturing process the top-loading model requires 3 hours of assembly and 6 hours of finishing. The front loading model requires 6 hours of assembly and 4 hours of finishing.
The company has 6 assembly workers and 8 finishers, each of whom works at most 30 per week. Each top-loading model brings a profit of $50 and each front-loading a profit of $40.

How many of each model should be produced to maximize profit?

3) [4 points] Determine whether or not the following problems are in standard form. Explain your answer. **Do not attempt to solve them.**

a) Maximize $P = 3x_1 + 2x_2$ subject to the constraints
$$x_1 + 2x_2 + x_3 \le 12$$
$$4x_1 - x_2 + 2x_3 \ge 6$$
$$x_1 \ge 0 \quad x_2 \ge 0$$

c) Minimize $C = 2x_1 - x_2$ subject to the constraints
$$x_1 + x_2 \ge -4$$
$$2x_1 + x_2 \ge 10$$
$$x_1 \ge 0 \quad x_2 \ge 0$$

4) [6 points] For each of the following, determine whether each tableau

i) is the final tableau (if it is, give the solution)
ii) requires further pivoting (if so, circle the pivot element)
iii) indicates no solution (explain why)

a)

BV	P	x_1	x_2	s_1	s_2	RHS
s_1	0	0	0	1	1	40
s_2	0	1	–1	0	1	30
P	1	0	–4	0	1	20

b)

BV	P	x_1	x_2	s_1	s_2	RHS
s_1	0	2	–1	1	0	–3
s_2	0	1	–2	0	1	–5
P	1	–4	–3	0	0	0

5) [12 points] Maximize $P = 6x_1 + 3x_2 + 2x_3$

subject to constraints
$$2x_1 + 2x_2 + 3x_3 \le 30$$
$$2x_1 + 2x_2 + x_3 \le 12$$

$$x_1 \ge 0 \quad x_2 \ge 0 \quad x_3 \ge 0$$

6) [12 points] Minimize $C = 2x_1 + 3x_2 + 4x_3$ using the Duality Principle,

$$\begin{aligned} & x_1 - 2x_2 - 3x_3 \geq -2 \\ \text{subject to constraints} \quad & x_1 + x_2 + x_3 \geq 2 \\ & 2x_1 + x_3 \geq 3 \end{aligned}$$

$$x_1 \geq 0 \quad x_2 \geq 0 \quad x_3 \geq 0$$

7) [12 points] Maximize $P = 5x_1 + 2x_2$

$$\begin{aligned} & x_1 + x_2 \geq 11 \\ \text{subject to constraints} \quad & 2x_1 + 3x_2 \geq 24 \\ & x_1 + 3x_2 \leq 18 \end{aligned}$$

$$x_1 \geq 0 \quad x_2 \geq 0$$

8) [6 points] The total number of MP3 players sold by Tech Soft Inc. is growing exponentially. In 1997 the company sold 8 million. In 2003 the number of players sold was 10 million. If this exponential trend continues how many will have been sold by 2011?

9) [4 points] When it first began a supermarket had takings of SR 2.34 million per year. The takings seven years later were SR 3.45 million . At what rate per year is the supermarket growing?

10) [4 points] After how many years will a SR 345,000 apartment be worth at least SR 1 million if it increases in value by 6.09% per year?

11) [4 points] Find the purchasing power of $2000 after 3 years given that the rate of inflation averages 3.5% per year.

12) [4 points] If the inflation rate averages 4.23% per year , how long is it until the purchasing power is cut in half?