Prince Sultan University

Department of Mathematical Sciences

Major II Exam

Semester II, 2008 SPRING (072)

Tuesday, 29 April 2008

A

MATH 101 – Finite Mathematics

Time Allowed : 2 hours

Maximum Points: 100 points

Name of the student:_____

ID number :_____

Section # : _____ Instructor's Name: _____

1. You may use a scientific calculator that does not have programming or graphing capabilities.
2. You may NOT borrow a calculator from anyone.
3. You may NOT use notes or any textbook.
4. There should be NO talking during the examination.
5. Your exam will be taken immediately if your mobile phone is seen or heard
6. Looking around or making an attempt to cheat will result in your exam being cancelled
7. Provide an organized complete solution for each Question.
8. This examination has a total of 8 pages and 12 problems. Make sure your paper has all these problems.

Question	Maximum score	Your Score
Q.1	5	
Q.2	12	
Q.3	6	
Q.4	6	
Q.5	6	
Q.6	6	
Q.7	6	
Q.8	12	
Q.9	7	
Q.10	12	
Q.11	12	
Q.12	10	
Total	100	

Q.1(8 points) ***Write True(T) or False(F) for each of the following statements.***

_____ 1) Investing at 8% compounded monthly is better than investing at 8% compounded annually?

_____ 2) $\$1,000$ invested at 7% compounded annually for $1-year$ produces more interest than investing $\$1,000$ at 7% simple interest for $1-year$.

_____ 3) All Linear Programming problems have solutions.

_____ 4) In a linear programming problem there may be more than one point that maximizes or minimizes the objective function.

_____ 5) If a linear programming problem has a solution, it is located at the center of the set of feasible points.

Q.2(12 points) ***Circle the correct answer.***

1) The pivot element in the following tableau is located in:

$$\begin{array}{c|ccccccc|c} & P & x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & RHS \\ \hline & 0 & 2 & 0 & 4 & 1 & 5 & 0 & 30 \\ & 0 & 1 & 1 & 2 & 0 & 3 & 0 & 20 \\ & 0 & 3 & 0 & -1 & 0 & -2 & 1 & 5 \\ \hline & 1 & -6 & 0 & -8 & 0 & \frac{1}{2} & 0 & 1200 \end{array}$$

(a) row 1 , col. 2 (b) row 3 , col. 4 (c) row 1 , col. 4 (d) row 2 , col. 4

2) The solution of the LP problem that has the following simplex tableau is:

$$\begin{array}{c|ccccccc|c} & P & x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & RHS \\ \hline & 0 & -5 & 0 & 1 & 3 & 4 & 0 & 12 \\ & 0 & 0 & 1 & 0 & -4 & 0 & 0 & 27 \\ & 0 & -5 & 0 & 0 & 3 & 2 & 1 & 11 \\ \hline & 1 & 5 & 0 & 0 & 2 & 2 & 0 & 22 \end{array}$$

(a) $P_{\max.} = 22$, $x_1 = 0$, $x_2 = 27$, $x_3 = 12$ (b) $P_{\max.} = 22$, $x_1 = 11$, $x_2 = 12$, $x_3 = 27$

(c) $P_{\max.} = 22$, $x_1 = 0$, $x_2 = 0$, $x_3 = 12$ (d) $P_{\max.} = 22$, $x_1 = 12$, $x_2 = 27$, $x_3 = 11$

3) The ***basic variables*** in the following simplex tableau *are:*

$$\begin{array}{c|ccccc|c} & P & x_1 & x_2 & s_1 & s_2 & \text{RHS} \\ \hline & 0 & 1 & 3 & 0 & 5 & 14 \\ & 0 & 0 & 4 & 1 & -3 & 10 \\ \hline & 1 & 0 & 3 & 0 & 4 & 26 \end{array}$$

(a) $x_1, x_2,$ and P (b) $x_2, s_2,$ and P (c) $x_1, s_1,$ and s_2 (d) $x_1, s_1,$ and P

4) The following point is in the solution set of the given system of inequalities.

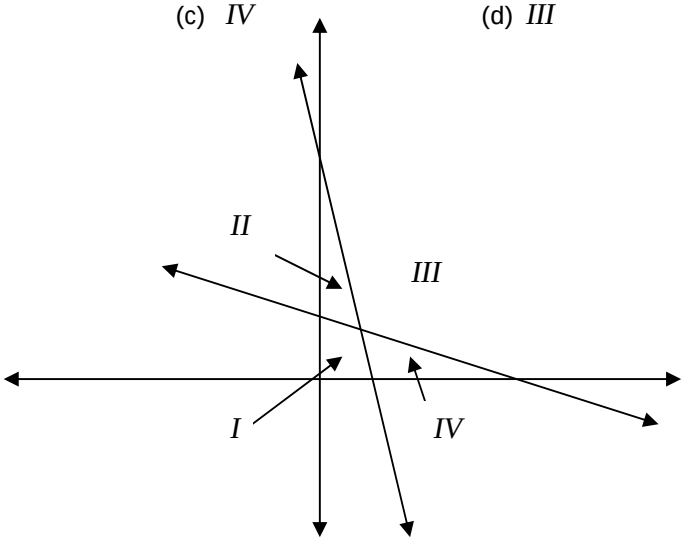
$$\begin{cases} x+2y \le 8 \\ 2x-y > 4 \end{cases}$$

(a) $(2,6)$ (b) $(8,3)$ (c) $(0,-4)$ (d) $(4,-3)$

5) Which region represents the solution region of the following system of linear inequalities?

(a) II (b) I (c) IV (d) III

$$x+2y \ge 8$$
$$4x+y \le 12$$
$$x \ge 0, y \ge 0$$



6) If a minimum problem has 3 variables and 2 constraints, then its dual problem will have:

(a) 3 variables and 2 constraints (b) 2 variables and 3 constraints
(c) 5 variables and 5 constraints (d) 3 variables and 5 constraints

7) How much interest will be due on a $2000 loan at 15% annual simple interest at the end of 18 months?

(a) $400 (b) $450 (c) $500 (d) $550

8) Find the effective rate for an account that pays 9% interest compounded monthly.

(a) 9.38% (b) 8.16% (c) 12.25% (d) 9.78%

Q.3(6 points) An investment company pays 5% interest compounded semiannually. You want to have $\$16,000$ in the future, how much should you deposit now to have that amount 5 years from now?

Q.4(6 points) In order to accumulate enough money for a down payment on a house, a couple deposits $\$400$ per month into an account paying 6% compounded monthly. How much money will be in the account in 8 years?

Q.5(6 points) If $20,000\ SR$ are invested in an account that earns 7% simple interest per year. How much is in the account after 20 months?

Q.6(6 points) How long will it take $\$4,000$ to grow to $\$10,000$ if it is invested at 7% compounded continuously? (Round your answer to the nearest year)

Q.7(6 points) If you want to retire with 500,000 SR in 30 years, how much should you invest each month into an account that pays 10% compounded monthly?

Q.8(12 points) For the following system of linear inequalities:

$$5x + y \geq 40$$
$$x + 3y \geq 36$$
$$x \geq 0, y \geq 0$$

a. Graph the system.
b. Is the graph bounded or unbounded.
c. List the corner points of the graph.
d. Use the information above to find the maximum and minimum values of the objective function: $z = 5x + 12y$

Q.9(7 points) Write the *Dual Problem* for the following minimum problem *(DO NOT SOLVE)*

Minimize $C = 18x_1 + 43x_2$

Subject to the constraints:

$$2x_1 + 5x_2 \geq 24$$
$$3x_1 + 7x_2 \geq 34$$
$$x_1 \geq 0 \ , \ x_2 \geq 0$$

Q.10(12 points) Use the simplex method to maximize $P = 2x_1 + 3x_2 + 4x_3$

subject to the constraints:

$$x_1 + x_3 \leq 8$$

$$x_2 + x_3 \leq 6$$

$$x_1 \geq 0 \ , \ x_2 \geq 0 \ , \ x_3 \geq 0$$

(Give the complete solution)

Q.11(12 points) Use the simplex method to minimize $C = 6x_1 + 3x_2$

subject to the constraints:

$$x_1 + x_2 \geq 4$$

$$3x_1 + 4x_2 \geq 12$$

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

(Give the complete solution)

Q.12(10 points) A company makes two models of desks: a student model and a secretary model.
Each student model requires 2 hours of woodworking and 4 hours of finishing, while the secretary model requires 4 hours of woodworking and 6 hours of finishing. The company has only a total of 200 hours available for woodworking and a total of 360 hours available for finishing.
The company makes a $40 profit on each student model and a $50 profit on each secretary model it sells. How many desks of each model should the company make to ***maximize its profit***.
(Write the system of linear inequalities and the objective function and then solve)
(Use any appropriate method)