King Fahd University of Petroleum & Minerals
Department of Mathematical Sciences

Semester I, 2009/2010 (091)

Math 131 – Second Major Exam

Date: Dec 22, 2009 *Time: 5:30-7:00 pm*

Calculator can be used

Name: _____ I.D. # _____ Sec. # _____

QUESTION	GRADE
1	/11
2	/11
3	/11
4	/11
5	/11
6	/11
7	/11
8	/11
9	/11
10	/11
TOTAL	/110

Q1. Three copy-machines are used to copy books in Mathematics, Physics and Chemistry. Assume that selling each of these books yields a profit of 20 SR. The time needed on each machine to produce each type of these books is given in the table below:

	Mathematics	Physics	Chemistry
Machine I	4	2	1
Machine II	2	1	1
Machine III	3	1	3

If Machine I is available for 380 hours monthly, Machine II is available 210 hours monthly and Machine III is available for 350 hours monthly, find the monthly profit achieved by making use of all the available time on the machines.

Q2. Solve the following system using matrix reduction:

$$\begin{cases} x + y + z = 0 \\ 5x - 2y - 9z = 0 \\ 3x + y - z = 0 \\ 3x - 2y - 7z = 0 \end{cases}$$

Q3. A company wishes to lease temporary office space for a period of 6 months. The rental fee is 1500 SR per month payable at the beginning of each month. Suppose that the company wants to make a payment at the beginning of the rental period to cover all rental fees for the six-month period. If money is worth 9% compounded monthly, how much should this payment be? *(Round your answer to 2 decimal places)*

Q4. A father sets ups a trust fund for the education of his new born son by a single payment, so that after 18 years there will be 200,000 SR in that fund. If the interest is compounded continuously and you know there will be 100,000 Riyals in the fund after 6 years of the initial payment, how much money (to the nearest Riyal) should be paid in the fund initially?

Q5. Radio Station Call Letters. Suppose the call letters of a radio station consist of four letters. How many different 4 – letter radio station call letters can be made if

(a) the first letter must be K or W and no letter may be repeated?
(b) repeats are allowed, but the first letter is K or W?
(c) the first letter is K or W, there are no repeats, and the last letter is R?
(d) the first letter must be K or W and the last letter is not O?

Q6. To what sum will 2000 SR amount in 8 years if invested at 6% effective rate for the first 4 years and at 6% compounded semiannually for the remaining 4 years? *(Round your answer to 2 decimal places)*

Q7. A company manufactures three types of patio furniture: chairs, rockers, and chaise lounges. Each requires wood, plastic, and aluminum as shown in the following table:

	Wood	Plastic	Aluminum
Chair	1 unit	1 unit	2 units
Rocker	1 unit	1 unit	3 units
Chaise Lounge	1 unit	2 units	5 units

The company has available 400 units of wood, 500 units of plastic, and 1450 units of aluminum. Each chair, rocker, and chaise lounge sells for $ 21, $ 24, and $ 36, respectively. Assume that all furniture can be sold, set up the standard linear programming problem and solve it by using the simplex method to determine a production order so that total revenue will be maximum**.** What is the maximum revenue?

Q8. A college promotion committee consists of a total of 6 members including a chairman, whose vote would be counted twice in case of a tie. In how many ways can the committee reach a decision in favor of a promotion? (*assume that each member will vote in favor or against the promotion)*

Q9. Minimize $Z = 4u + 4v + 6w$ subject to the following constraints

$$\begin{aligned} u - v - w &\leq 3 \\ u - v + w &\geq 3 \\ u, v, w &\geq 0 \end{aligned}$$

Q10. A debt of $ 5000 due five years from now and $ 5000 due ten years from now is to be repaid by a payment of $ 2000 in two years, a payment of $ 4000 in four years, and a final payment at the end of six years. If the interest rate is 2.5 % compounded annually, how much is the final payment?