King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

Math 131 (Term 133)

Exam 2

9:30 – 11:00 p.m. (Duration: 90 minutes)

Student Name_____ **Student ID:** _____

Question	Score
1	\20
2	\20
3	\10
4	\10
5	\10
6	\10
7	\10
8	\10
Total Score	\100

Exercise 1 **[20 points]**

Use the dual and simplex method to solve the following problem:

Minimize $Z = 5x_1 + 2x_2 + 3x_3$ subject to $\begin{cases} x_1 + x_3 \geq 5 \\ x_1 + x_2 + x_3 \geq 4 \\ -x_1 + x_2 - x_3 \leq 1 \\ -x_2 + x_3 \leq 3 \end{cases}$

Dual Problem:

Final Tableau (Show your work on the back of this page)

Initial Tableau:

Solution of the Dual Problem:

Solution of the Initial Problem:

Exercise 2 [20 points]

In order to replace a machine in the future, a company is placing equal payments into a sinking fund at the end of each year so that after 10 years the amount in the fund is 25,000 SR. The fund earns 6% compounded annually.

(a) Find the amount of the annual payment

(b) Find the amount in the fund after 6 years

(c) After 6 years, the interest rate increases and the fund earns 7% compounded annually. So the company decreases the amount of the remaining annual payments. Find the amount of the new annual payment. (`2 decimal places`)

Exercise 3 [10 points]

A debt of 10,000 SR due five years from now and 5,000 SR due ten years from now is to be repaid by a payment of 2,000 SR in two years, a payment of 4,000 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? (2 decimal places)

Exercise 4 [10 points]

A student won a University prize. He will receive a check for 10,000 SR now and a similar one at the beginning of each year for the next 4 years. To provide all these payments, the University purchased an annuity at 8% compounded quarterly. How much did the annuity cost the university? (2 decimal places)

Exercise 5 [10 points]
A die is rolled 5 times. How many results are possible if the 1st and 3rd rolls are odd and the 2nd and 4th are even?

Exercise 6 [10 points]
A hand of 7 cards is dealt from a deck of 52 cards. How many hands are possible with 3 hearts and 3 black cards?

Exercise 7 [10 points]
How many arrangements of all the letters of the word **MISSISSIPPI** are possible?

Exercise 8 [10 points]
When at least one of 4 flags colored red, green, yellow, and blue are arranged vertically on a flagpole, the result indicates a message. Different arrangements indicate different messages. How many messages are possible if at least 2 flags are used?