**PRINCE SULTAN UNIVERSITY**

**MATH 101** **Major Exam II**

**Start: 6:30 PM**

**End: 8:00 PM**

**Name:** _____

**I.D. :** _____

**Section:** _____

| Dr. Nabil | Dr. Bahaaeldin | Mr. Khalid |
|---|---|---|
| | | |

1. Answer all questions.
2. This exam consists of 5 pages, 11 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 | **16** | |
| 5,6,7 | **24** | |
| 8,9,10,11 | **26** | |
| **TOTAL** | **80** | |

**Q1) (8 points, 4 points each):** Determine which one of the following linear programming problem is in standard form **EXPLAIN**

a) Maximize $P = 2x_1 + 4x_2 + x_3$ subject to constraints:

$$\begin{cases} x_1 + x_2 + x_3 \leq 15 \\ x_1 + 6x_2 + 3x_3 \leq 4 \\ x_2 \geq 0 \end{cases}$$

b) Minimize $P = 3x_1 - 7x_2 + x_3$ subject to constraints:

$$\begin{cases} 4x_1 + x_2 + 2x_3 \geq 18 \\ 2x_1 + 5x_2 + 3x_3 \geq 9 \\ x_1 \geq 0\,, x_2 \geq 0, x_3 \geq 0 \end{cases}$$

**Q2) (6points):** A farmer has at most 200 acres of farmland suitable for cultivating crops of soybeans, corn, and wheat. The costs for cultivating soybeans, corn, and wheat are \$40, \$50, and \$30 per acre, respectively. The farmer has a maximum of \$18,000 available for land cultivation. Soybeans, corn, and wheat require 20, 30, and 15 hours per acre of labor, respectively, and there is a maximum of 4200 hours of labor available. If the farmer expects to make a profit of \$70, \$90, and \$50 per acre on soybeans, corn, and wheat, respectively, how many acres of each crop should he plant in order to maximize his profit? **Write the Linear Programing Problem (Objective function and constraints) that represents this problem. DONOT SOLVE**

**Q3) (8 points):** Minimize $P = 6x_1 + 3x_2$ subject to constraints:

$$\begin{cases} x_1 + x_2 \geq 2 \\ 2x_1 + 6x_2 \geq 6 \\ x_1 \geq 0\,, x_2 \geq 0, \end{cases}$$

**Q4) (8 points):** Maximize $P = 4x_1 + x_2$ subject to constraints:

$$\begin{cases} 2x_1 + 3x_2 \leq 12 \\ x_1 + x_2 \geq 3 \\ x_1 \geq 0\,, x_2 \geq 0, \end{cases}$$

**Q5) (6 points):** Find the interest due on a loan of 36,000SR borrowed for 19 months at 9.5% simple interest

**Q6) (6 points):** Find the proceeds for a discounted loan of 45,000SR repaid in 8 months at 12%.

**Q7) (12 points, 6 points each):** If a bank pays 8% interest compounded. How much should be deposited now to have

a) $7,000 after 3 years compounded semiannually?

c) $9,000 after 9 years compounded monthly?

**Q8) (7 points ):** Find the principal needed now to get $1200 after 2 year at 11% compounded continuously.

**Q 9) (7 points):** Find the effective rate of interest for (TAKE $P = \$100$) 14% compounded monthly.

**Q10) (6 points):** How long does it take for an investment to triple in value if it is invested at 12% compounded

a) Monthly?

b) Continuously?

**Q11) (6 points):** Find the amount in an account after 8 years, if $600 is deposited every month at 9% compounded monthly.