<table>
<thead>
<tr>
<th>Question</th>
<th>Score</th>
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<tr>
<td>1</td>
<td>(\frac{16}{16})</td>
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<td>6</td>
<td>(\frac{20}{16})</td>
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<td><strong>Total Score</strong></td>
<td>(\frac{100}{16})</td>
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Exercise 1 (16 points)
A small business predicts its revenue growth by a straight-line method with a slope of $10,000 \text{ SR}$ per year. In its tenth year, it had revenues of $110,000 \text{ SR}$. Find an equation that describes the relationship between the revenue $R$ and the number of years $T$ since it opened for business.

Exercise 2 (16 points)
A marketing firm estimates that $n$ months after the introduction of a client’s new product, $f(n)$ thousand households will use it, where

$$f(n) = \frac{6}{5}n(10 - n), \quad 0 \leq n \leq 10.$$  

Estimate the maximum number of households that will use the product.
Exercise 3 (16 points)
Supply and demand equations for a certain product are, respectively, \(3q - 200p + 1800 = 0\) and \(q + 100p - 1800 = 0\). Where \(p\) represents the price per unit in Riyals and \(q\) represents the number of units sold per time period. Find the equilibrium price when a tax of 0.27 SR per unit is imposed on the supplier.

Exercise 4 (16 points)
A produce grower is purchasing fertilizer containing three nutrients: A, B, and C. The minimum monthly requirements are 320 units of A and 400 of B; and the maximum monthly requirements are 800 units of C. There are two popular blends of fertilizer on the market. Blend I, costing 10 SR a bag, contains 2 units of A and 1 unit of B. Blend II, costing 20 SR a bag, contains 2 units of B and 20 units of C. How many bags of each blend should the grower buy each month to minimize the cost of meeting the nutrient requirements? Formulate the problem (Do not solve it).
Exercise 5 (16 points)

A firm produces three products \( A \), \( B \), and \( C \) that require processing by three machines I, II, and III. The time in hours required for processing one unit of each product is given by the following table:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine I</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Machine II</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Machine III</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Machine I is available for 380 hours, Machine II is available 210 hours, and Machine III is available for 350 hours. Use matrix reduction method, to find how many units of each product should be produced to make use of all the available time on the machines.

Let

\[ x = \]

\[ y = \]

\[ z = \]

System of Equations:

\[
\text{Augmented Matrix:}
\]

Reduced Matrix: (Show your work on the back of this page)

Solution:

\[ x = \]

\[ y = \]

\[ z = \]
Exercise 6 (20 points)

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

Minimize $Z = 2x_1 + 5x_2 + 3x_3$ subject to

\[
\begin{align*}
    x_2 + x_3 & \geq 5 \\
    x_1 + x_2 + x_3 & \geq 4 \\
    x_1 - x_2 - x_3 & \leq 1 \\
    -x_1 + x_3 & \leq 3
\end{align*}
\]

Dual Problem:

Initial Tableau:

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

Solution of the Dual Problem:

Solution of the Initial Problem: