Graduate Midterm Examination

Please Place your name of the BACK of the LAST PAGE of the examination!

Question #1: _________________

Question #2: _________________

Question #3: _________________

Question #4: _________________

Grand Total $\sum$: ___________________
Graduate Midterm Examination

Please Place your name of the BACK of the LAST PAGE of the examination!

There are four questions on this examination. The first question is a series of (true-false) questions, each worth 3 points each for a total of 30 points. The other three questions are open-ended with point values as indicated. Please answer all questions and show all work on this examination paper. Please answer all questions and show all work on your examination paper. You may use the back of the sheets if necessary.

Question I 30 points:

In the following true-false questions, answer all questions, there is no penalty for guessing. Please circle the appropriate response!

Question II: 25 points

An assembly consists of two parts A and B. These parts go through the following operations in order: Forging, Drilling, Grinding, Painting and Assembly. The duration of these operations in days are summarized below:

<table>
<thead>
<tr>
<th>Part</th>
<th>Forging</th>
<th>Drilling</th>
<th>Grinding</th>
<th>Painting</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2.0</td>
<td>0.3</td>
<td>0.5</td>
<td>0.3</td>
</tr>
<tr>
<td>B</td>
<td>3.0</td>
<td>1.0</td>
<td>--</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Upon Painting part A is assembled in two days, then A and B are assembled together in one day. It is desired to find the least time required for the total assembly (this problem is called the critical path problem). Be sure to carefully think through what is happening in the assembly process.

i) Develop the network representation of the problem.

ii) Formulate the objective and determine an appropriate algorithm for its solution.

iii) Solve the problem with an algorithm we have studied this semester.
Question II (continued)
Question II (continued)
Question III: 25 points

A company is considering an investment plan with an investment horizon of 5 years. The investment opportunities available to them include:

1) One year bonds that yield 7% per year.
2) Three year bonds that yield 9% per year.
3) Five year bonds that yield 8% per year.

Please do the following:

a) Draw a network representation of the problem properly accounting for the beginning of the investment process and the year end maturity of the different bond investments. *Be sure to account for compound interest.*

b) Which algorithm is most suited for this problem and how should it be modified to solve this problem?

c) Find the optimal investment strategy.
Question III (continued)
Question III (continued)
Question IV: 20 points

Suppose forest $F$ consists of $t$ trees and contains $v$ vertices. How many edges are in the forest $F$?
Question IV (continued)
Question IV (continued)