Decision Modeling homework

- Due on Monday 19 December at 23:59
- You may complete the homework individually or pairs.
- Please submit your homework in PDF or Word format (zip them if you submit multiple files).

Task 1 [3 points]

A student may receive a final course grade of A, B, C, D, or F. The grade is derived as follows.

A student who has received a total of no lower than 90 percent on the first three assignments and exams and received a score no lower than 70 percent on the fourth assignment will receive an initial grade of A for the course. A student who has scored a total lower than 90 percent but no lower than 80 percent on the first three assignments and exams and received a score no lower than 70 percent on the fourth assignment will receive an initial grade of B for the course. A student who has received a total lower than 80 percent but no lower than 70 percent on the first three assignments and exams and received a score no lower than 70 percent on the fourth assignment will receive an initial grade of C for the course. A student who has scored a total lower than 70 percent but no lower than 60 percent on the first three assignments and exams and received a score no lower than 70 percent on the fourth assignment will receive an initial grade of D for the course. A student who has scored a total lower than 60 percent on the first three assignments and exams, or received a score lower than 70 percent on the fourth assignment, will receive an initial grade of F for the course. Once the instructor has determined the initial course grade for the student, the final course grade will be determined.

The student's final course grade will be the same as his or her initial course grade if no more than three class periods during the semester were missed. Otherwise, the student’s final course grade will be one letter grade lower than his or her initial course grade (for example, an A will become a B).

Questions

a) [1 point] Are there any conditions for which there was no action specified for the instructor to take? If so, what would you do to correct the problem?

b) [2 points] Capture the resulting decision logic as a decision table. You may use classic decision tables or DMN decision tables. If using DMN decision tables, you can decompose the decision into multiple tables as well. In the latter case, please provide both the business decision diagram and the decision tables (you can export them all together using Signavio’s PDF export function). But you don’t need to use Signavio if you don’t wish to.

Acknowledgment. This exercise is taken from the course material of Patricia O’Byrne, Dublin Institute of Technology
Task 2 [3 points, including 1 bonus point]
This exercise is about thinking how can we represent a decision table via geometric objects and how we can analyze decision tables with this geometric representation.

a) [1 point] Consider the DMN decision table in Figure 1. How could you represent exactly the same information as in this table by means of a set of rectangles? The answer this question should be an image with a set of rectangles (each rectangle with a label), so that someone can re-construct the decision table just by looking at the rectangles in the image and the text attached to them.

<table>
<thead>
<tr>
<th>UC</th>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Annual Income</td>
<td>Loan Size</td>
</tr>
<tr>
<td>A</td>
<td>[0..1000]</td>
<td>[0..1000]</td>
</tr>
<tr>
<td>B</td>
<td>[250..750]</td>
<td>[4000..5000]</td>
</tr>
<tr>
<td>C</td>
<td>[500..1500]</td>
<td>[500..3000]</td>
</tr>
<tr>
<td>D</td>
<td>[2000..2500]</td>
<td>[0..2000]</td>
</tr>
</tbody>
</table>

Figure 1. Sample Decision Table

b) [1 point] By looking at the rectangles, what can you infer about the consistency and completeness of this decision table? Are there any missing or overlapping rules? Which ones?

c) [1 point] Imagine you have a DMN decision table with three input columns instead of two. Could you represent the table using geometric shapes (not necessarily rectangles)? How could you use this geometric representation to determine if a decision table is consistent and complete?