CMPUT 355 Quiz 3 Marking Rubric

Grading Rubric

```
Problem 1
    0.5 marks off for each wrong indentation
    1 mark off for each wrong order

Problem 2
    Each bold item in the table (see below) is worth 0.25 points

Problem 3
    a) 1 point for all correct values
       0.5 points for 2 out of 3 correct values
    b) 1 point for all correct values
       0.5 points for 2 out of 3 correct values

Problem 4
    2 points for correct answer
        1 point for incorrect answer with work showing some understanding

Problem 5
    For all versions, collectively over all three passages, identifying the
    correct path has a mark, identifying the correct MAX and MIN options have
    1.5 points, and identifying the alpha and beta values have 1.5 points.

Problem 6
    3 points: all possible non-isomorphic losing moves for X
    1 points: showed the only winning moves for O
              (Note: deducted marks for showing more than one move for O and
              not providing winning moves)

Problem 7
    1 point for correctly identifying the minimax value
    2 points for given a valid proof tree
        part marks given for solutions that show sufficient understanding
    1 point for correctly labelling every leaf in the proof tree
```

Quiz 3a

Problem 1.

```
(3)
    (8)
    (7)
        (10)
        (4)
            (1)
            (5)
            (6)
                (2)
        (9)
```

Problem 2. Note: rows 3 and 4 might have been merged into one row only as k, 9, 9, 8.

Note: since D stays unchanged, writing row 5 is optional.

change	node	minimax	alpha	beta
2	**D**	**8**	**6 (or -)**	**8**
3	**K**	**(-∞ or) -**	**6**	**8**
4	**K**	**($\geq$) 9**	**9**	**- (or 8)**
(5)	(D)	(8 or -)	(6 or -)	(8 or -)
6	**A**	**8**	**8**	**-**

Problem 3. a) A: 5, B: 5, C: 1

b) A: 7, B: 7, C: 9

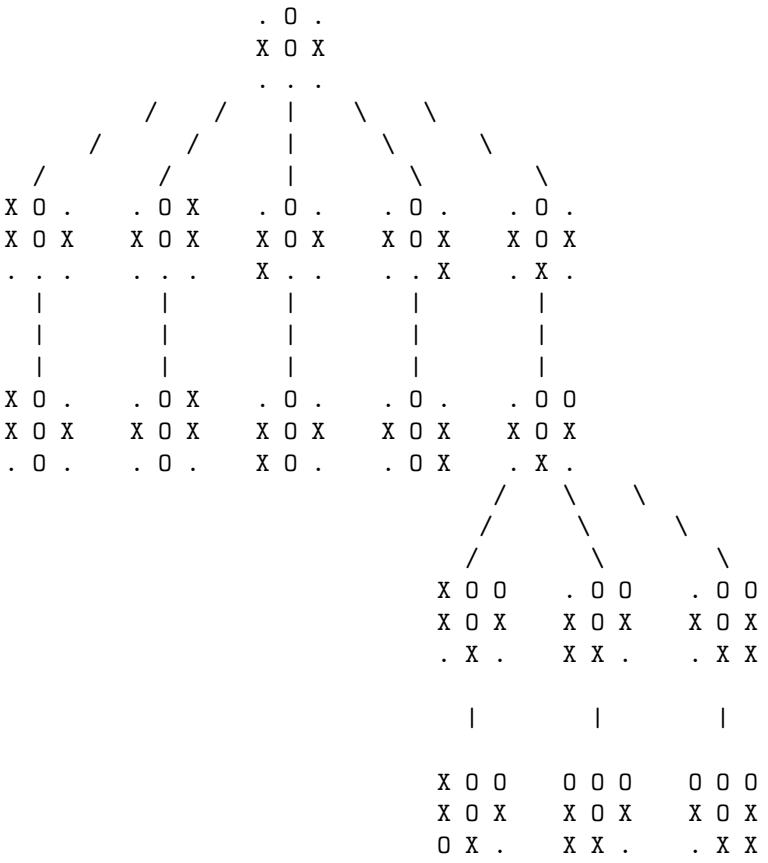
Problem 4. The leaf nodes reached are: C,H,G,A, and F.

Problem 5. E: on path-to-root **E-B-A**, MAX has option **E-K**, so alpha **15**, MIN has move option **B-D**, so beta **11**, so alpha $\geq$ beta.

N: on path-to-root **N-F-C-A**, MAX has option **F-M**, so alpha **3**, MIN has move option **N-1**, so beta **1**, so alpha $\geq$ beta.

C: on path-to-root **C-A**, MAX has option **A-B**, so alpha **11**, MIN has move option **C-F**, so beta **3**, so alpha *geq* beta.

Problem 6. One of the correct answers:

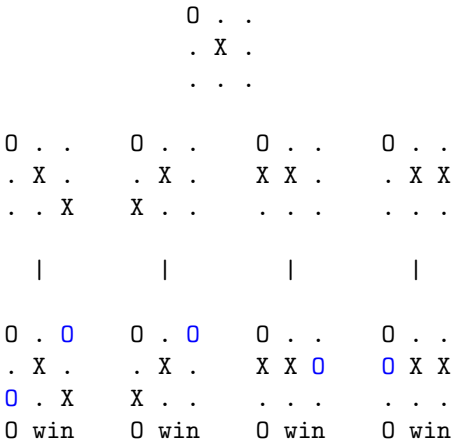


Problem 7. Due to ambiguous wording of this question, we allowed for two win conditions:

(a) O wins if it gets three in a row, or if the game ends without an X win

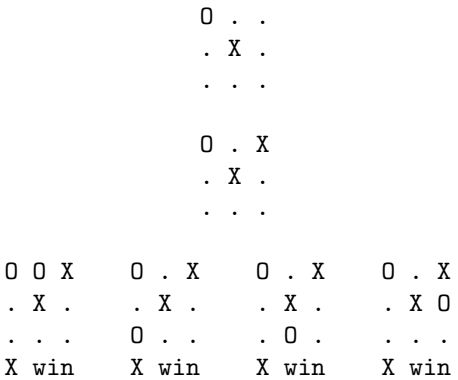
(b) O only wins if the game ends without an X win

Here is the proof tree for win condition (a). This position is an O-win



Note: a valid proof tree must have only one of the blue O's for each leaf.

There are multiple valid proof trees for win condition (b). One is given below. In this case, the position is an X-win



Quiz 3b

Problem 1.

```
(9)
    (2)
    (1)
        (4)
        (10)
            (7)
            (5)
            (6)
                (8)
        (3)
```

Problem 2. Note: rows 3 and 4 might have been merged into one row only as k, 10, 10, 9.

Note: since D stays unchanged, writing row 5 is optional.

change	node	minimax	alpha	beta
2	**D**	**9**	**6 (or -)**	**9**
3	**K**	**(-∞ or) -**	**6**	**9**
4	**K**	**($\geq$) 10**	**10**	**- (or 9)**
(5)	(D)	(9 or -)	(6 or -)	(9 or -)
6	**A**	**9**	**9**	**-**

Problem 3. a) A: 7, B: 7, C: 1

b) A: 5, B: 9, C: 5

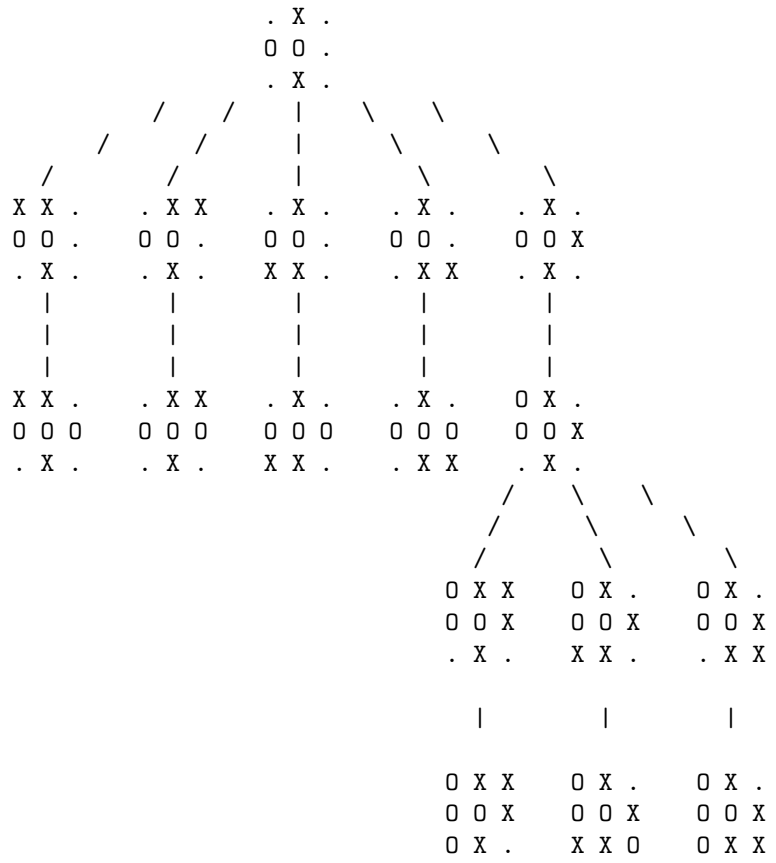
Problem 4. The leaf nodes reached are: E,B,F,D, and G.

Problem 5. C: on path-to-root **C-A**, MAX has option **A-B**, so alpha **11**, MIN has move option **C-F**, so beta **3**, so alpha *geq* beta.

E: on path-to-root **E-B-A**, MAX has option **E-K**, so alpha **15**, MIN has move option **B-D**, so beta **11**, so alpha $\geq$ beta.

N: on path-to-root **N-F-C-A**, MAX has option **F-M**, so alpha **3**, MIN has move option **N-1**, so beta **1**, so alpha $\geq$ beta.

Problem 6. One of the correct answers:



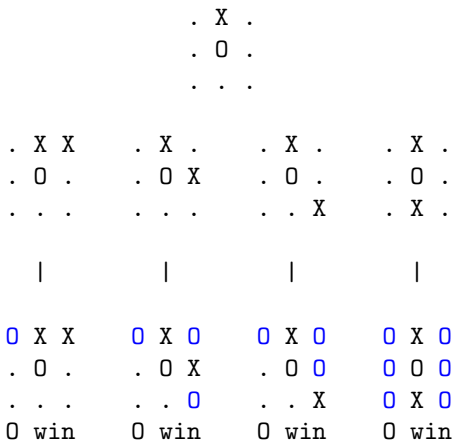
Problem 7. Due to ambiguous wording of this question, we allowed for two win conditions:

(a) O wins if it gets three in a row, or if the game ends without an X win

(b) O only wins if the game ends without an X win

For this position, the proof tree is the same.

This position is an O-win



Note: a valid proof tree must have only one of the blue O's for each leaf.

Quiz 3c

Problem 1.

```
(5)
    (9)
    (10)
        (6)
        (2)
            (4)
            (1)
            (7)
                (3)
        (8)
```

Problem 2. Note: rows 3 and 4 might have been merged into one row only as k, 10, 10, 9.

Note: since D stays unchanged, writing row 5 is optional.

change	node	minimax	alpha	beta
2	**D**	**7**	**6 (or -)**	**7**
3	**K**	**(-∞ or) -**	**6**	**7**
4	**K**	**($\geq$) 8**	**8**	**- (or 7)**
(5)	(D)	(7 or -)	(6 or -)	(7 or -)
6	**A**	**7**	**7**	**-**

Problem 3. a) A: 5, B: 1, C: 5

b) A: 3, B: 3, C: 9

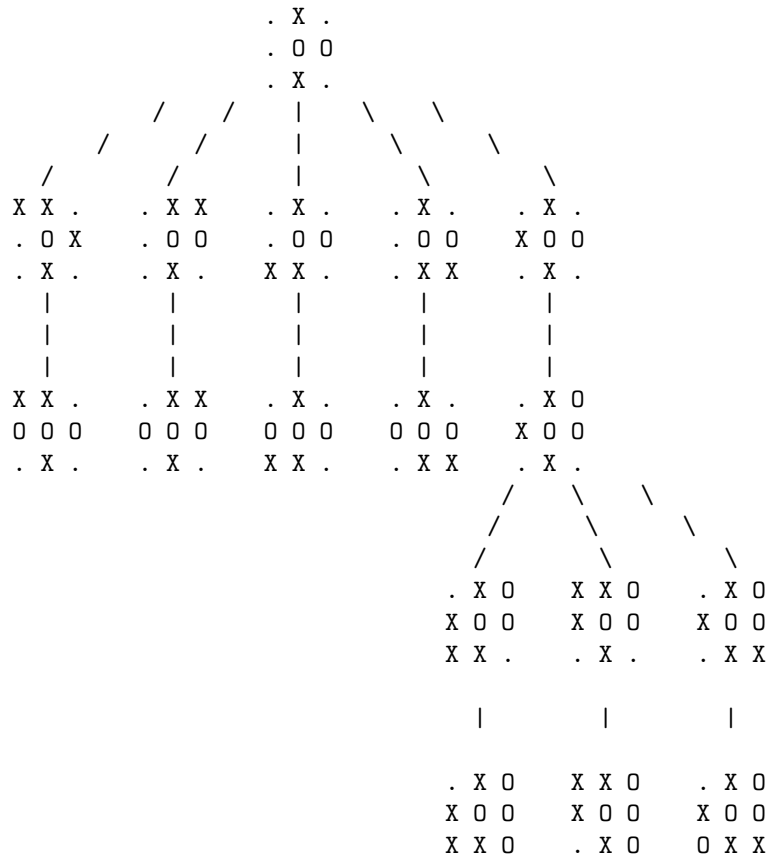
Problem 4. The leaf nodes reached are: A,B,E,C, and H.

Problem 5. N: on path-to-root **N-F-C-A**, MAX has option **F-M**, so alpha **3**, MIN has move option **N-1**, so beta **1**, so alpha $\geq$ beta.

C: on path-to-root **C-A**, MAX has option **A-B**, so alpha **11**, MIN has move option **C-F**, so beta **3**, so alpha *geq* beta.

E: on path-to-root **E-B-A**, MAX has option **E-K**, so alpha **15**, MIN has move option **B-D**, so beta **11**, so alpha $\geq$ beta.

Problem 6. One of the correct answers:



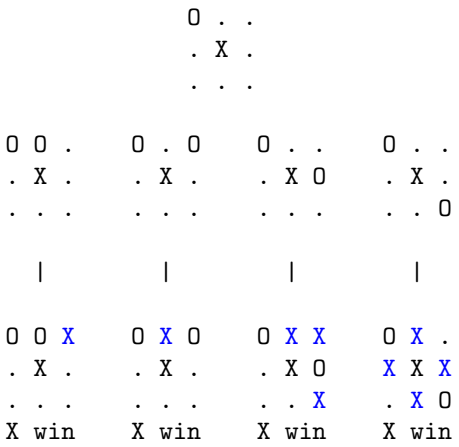
Problem 7. Due to ambiguous wording of this question, we allowed for two win conditions:

(a) X wins if it gets three in a row, or if the game ends without an O win

(b) X only wins if the game ends without an O win

Here is the proof tree for win condition (a).

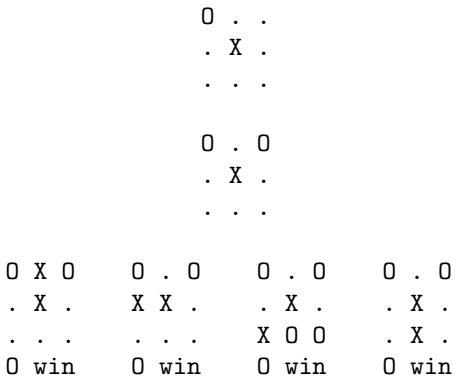
This position is an X-win



Note: a valid proof tree must have only one of the blue O's for each leaf.

Below are the two valid proof trees for win condition (b).

In this case, the position is an O-win



```
      O . .
      . X .
      . . .

      O . .
      . X .
      . . O

O . .    O . X
. X X    . X .
. . O    . . O
O win    O win
```