NAME:__________________________ University ID:______________________

CIRCLE THE NAME OF YOUR TA:  Yingxue Li  or  Johannes Matschke

If you don’t know the name of your TA, then write your Section Number: ________________

- By writing your name on this exam you certify that you have not violated the University’s Code of Academic Contact (for example, you have not copied from the work of another student and you have not knowingly facilitated cheating by another student).

- If you submit the exam without writing your name and ID, you well get a score of 0 for this exam.

- If you do not stop writing when told so (at the end), a penalty of 10 points will be deducted from your score.

Anything you write on the back of this page will not be used for credit. You can use it as scrap paper.
1. [30 points] Consider the following game, where the top number is Player 1’s payoff and the bottom number is Player 2’s payoff.

(a) [3 points] Write one pure strategy of Player 1: __________________________

(b) [3 points] How many pure strategies does Player 2 have? __________________________

(c) [24 points] Find all the pure-strategy subgame-perfect equilibria. [Use the space below and on the next page.]
The game reproduced for your convenience:
2. [30 points] Consider the following extensive-form game frame.

(a) Circle all the proper subgames.

(b) State in words how many proper subgames there are: _______________________

(c) How many pure strategies does Player 2 have? ______________________________

(d) Write one pure strategy of Player 2: ______________________________

(e) How many pure strategies does Player 3 have? ______________________________

(f) Write one pure strategy of Player 3: ______________________________
Consider the following three-player game where the payoffs are von Neumann-Morgenstern payoffs (in the order: player 1, player 2, player 3):

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td>0, 1, 1</td>
<td>3, 2, 2</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>1, 0, 0</td>
<td>1, 1, 4</td>
</tr>
</tbody>
</table>

Player 3 plays **E**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>C</strong></td>
<td>2, 0, 0</td>
<td>1, 1, 3</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>1, 2, 1</td>
<td>5, 3, 2</td>
</tr>
</tbody>
</table>

Player 3 plays **F**

(a) [9 points] For every player, state whether that player has a strictly dominated strategy. [Write your answer below.]

(b) [21 points] Find the Nash equilibrium of the game and calculate the payoff of every player at the Nash equilibrium. [Use the space below and on the next page.]
The game reproduced for your convenience:

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0,1,1</td>
<td>3,2,2</td>
</tr>
<tr>
<td>B</td>
<td>1,0,0</td>
<td>1,1,4</td>
</tr>
</tbody>
</table>

Player 1

Player 2

<table>
<thead>
<tr>
<th></th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2,0,0</td>
<td>1,1,3</td>
</tr>
<tr>
<td>B</td>
<td>1,2,1</td>
<td>5,3,2</td>
</tr>
</tbody>
</table>

Player 2

Player 3 plays E

Player 3 plays F
The game reproduced for your convenience:

\[
\begin{array}{c|cc}
\text{Player 1} & \text{C} & \text{D} \\
\hline
\text{A} & 0,1,1 & 3,2,2 \\
\text{B} & 1,0,0 & 1,1,4 \\
\end{array}
\]

Player 3 plays \( E \)

\[
\begin{array}{c|cc}
\text{Player 1} & \text{C} & \text{D} \\
\hline
\text{A} & 2,0,0 & 1,1,3 \\
\text{B} & 1,2,1 & 5,3,2 \\
\end{array}
\]

The game reproduced for your convenience:

\[
\begin{array}{c|cc}
\text{Player 2} & \text{C} & \text{D} \\
\hline
\text{A} & 0,1,1 & 3,2,2 \\
\text{B} & 1,0,0 & 1,1,4 \\
\end{array}
\]

Player 3 plays \( E \)

\[
\begin{array}{c|cc}
\text{Player 2} & \text{C} & \text{D} \\
\hline
\text{A} & 2,0,0 & 1,1,3 \\
\text{B} & 1,2,1 & 5,3,2 \\
\end{array}
\]

(c) [10 points] Suppose that Player 3 is first given the choice between “play” and “not play”. If she chooses “not play” then she gets a payoff of 2 while the other two players get a payoff of 0; if she chooses “play” then this becomes common knowledge among the three players and they play the simultaneous game given above. Draw an extensive-form game that represents this situation.