HEX BARON – Theory Questions (Total Marks: 50)

These questions refer to the preliminary material and require you to load the skeleton program, but <u>do not</u> require any additional programming.

1 This question refers to the `PlayGame` subroutine in the main program.

The subroutine does not currently print out the actual player names when displaying the status at the start of each turn; it just prints out 'Player One' and 'Player Two'.

a) How could this be corrected so that it would print out the names using the accessor method to the protected attribute `Name` from the `Player` class? [1]

.....

b) This is an example of using an accessor method. Why are accessor methods required in object-oriented programming? [1]

.....

2 This question refers to the `PlayGame` subroutine in the main program.

In the subroutine, the variable `Player1Turn` is set to True to indicate that it is Player One's turn. How does the game process Player Two's turn? [2]

.....

.....

.....

3 This question refers to the `HasMethod` method within the `Piece` class and the `ExecuteCommandInTile` method in the `HexGrid` class.

Explain how `HasMethod` is used in the `ExecuteCommandInTile` method. [2]

.....

.....

.....

4 This question refers to the `GetDistanceToTileT` method in the `Tile` class.

`GetDistanceToTileT` is used to calculate the distance from the current tile to another tile.

a) Explain how this calculation is performed. [3]

.....

.....

.....

.....

.....

4 b) Give a worked example of this calculation if the current tile has coordinates (2,-3,0) and the destination tile has coordinates (4,-4,0). All coordinates are given in (x,y,z) form. [2]

.....

.....

.....

.....

5 The `BaronPiece`, `LESSPiece` and `PBDSPiece` classes all inherit from the `Piece` class.

a) Explain what is meant by 'inheritance'. [1]

.....

.....

b) Why isn't there a 'SerfPiece' class? [1]

.....

.....

6 This question refers to the `BaronPiece` class and the `Piece` class.

The `BaronPiece` class overrides the public method `CheckMoveIsValid` from its parent.

a) Explain what is meant by 'overriding'. [2]

.....

.....

.....

b) Explain why the method was overridden in this case. [2]

.....

.....

.....

7 Big-O notation is used to measure the time complexity of algorithms.

a) Examine the `SetUpNeighbours` method in the `HexGrid` class. State its time complexity. [1]

.....

b) Which other method is used as a measure of the complexity of algorithms? [1]

.....

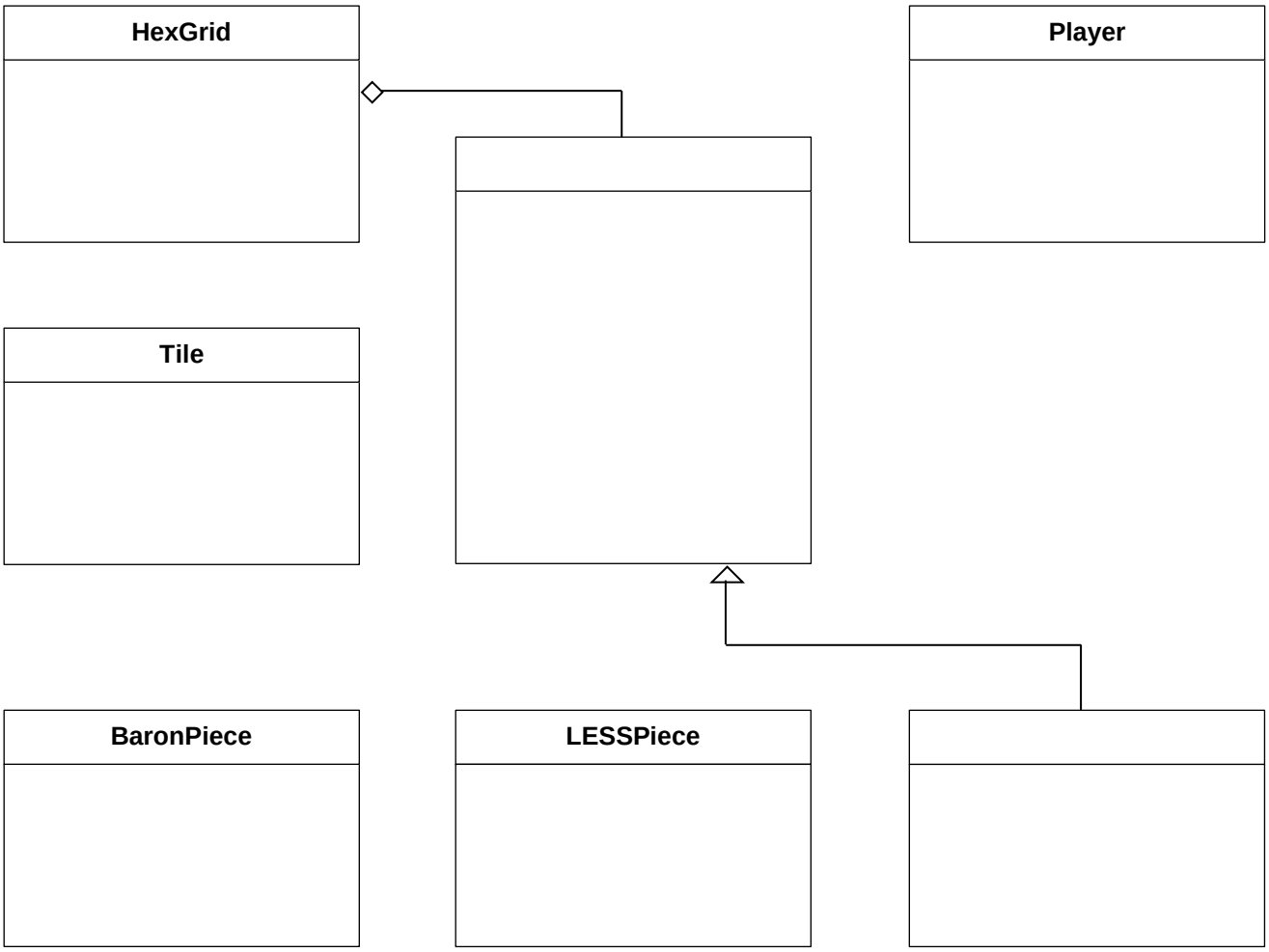
8 The skeleton program uses a Comma Separated Values (CSV) file as the data structure for a saved game. Explain why a CSV file is suitable for cross-platform applications. [1]

.....

.....

9 Class diagrams can be represented using Unified Modeling Language (UML).

Add the missing class names and relationships to the diagram below: [4]



10 This question refers to the `ExecuteUpgradeCommand` method of the `HexGrid` class.

a) What does a return value of -1 from this method mean? [1]

.....

.....

b) What does a return value of 5 from this method mean? [1]

.....

.....

11 This question refers to the `Dig` method of the `PBDSPiece` class and the `ExecuteCommandInTile` method of the `HexGrid` class.

When a 'dig' command is issued by a player, it is possible that the tile will be changed from a peat bog to a field and that they will receive 5 fuel instead of the normal 1.

Explain how this eventuality is processed in the code with specific references to the variables used, function calls made and return values. [4]

.....

.....

.....

.....

.....

.....

12 This question refers to the `DestroyPiecesAndCountVPs` method of the `HexGrid` class and to the `Piece` class.

For a piece to be destroyed in the game, it needs to have two connections to immediate neighbours (i.e. pieces in two of the tiles that share a side with it).

a) Explain how the `DestroyPiecesAndCountVPs` method uses polymorphism to access the protected attribute `ConnectionsToDestroy` of the Piece class. [2]

.....

.....

.....

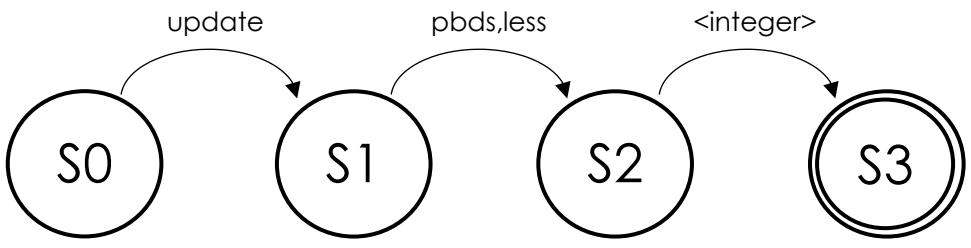
b) Why is polymorphism not possible for private attributes? [1]

.....

.....

13 This question refers to the `CheckUpgradeCommandFormat` subroutine in the main program.

Currently the validation performed by this subroutine could be represented using the following FSM (note that the 0 or higher condition is not currently checked in the code but needs to be part of the answer).



13 Where <integer> is any valid (0 or higher) integer.

a) Write down the regular expression that is the equivalent of this FSM. [3]

.....

b) Improve your regular expression so that it only accepts integers from 0 to 99. [1]

.....

c) What is the definition of a regular language? [1]

.....

14 This question refers to the `GetGridAsString` method of the `HexGrid` class.

a) State the identifier for a local variable used in this method. [1]

.....

b) What are the advantages of using local variables? [3]

.....

.....

.....

.....

c) This method uses one private and two protected attributes. What is the difference between a private and a protected attribute? [2]

.....

.....

.....

15 This question refers to the `ExecuteSpawnCommand` method of the `HexGrid` class.

Explain how the method works, including reference to how it meets the success condition for spawning a new Serf (it must be on an empty square adjacent to that player's Baron). [6]

.....

.....

.....

.....

.....

.....

.....

.....

