Question 1

Approach:

- As mentioned in the question, min-max with alpha beta pruning is used to solve the given problem.
- All possible successors for a given board are generated based on the given rules. Using min-max algorithm along with the heuristic value, the best state among the generated successors is selected.

Design Decisions:

- We started with a basic heuristic function that works based on the number of pieces on the board. The problem faced with this heuristic was all the pieces were given the same importance contrary to how we play the game.
- This resulted in important pieces being killed at the later stage of the game.
- Reference: https://chessprogramming.wikispaces.com/Evaluation. Using the information from the source we constituted following heuristics:
    - Material Heuristic: Each piece is assigned a standard value based on its importance on the board, with Kingfisher being the highest and Parakeet being the lowest. Heuristic value is calculated by adding weights of each piece for both white and black players and then substracting both values.
    - Piece-Square tables: The source provides standardized matrices depicting 'good' and 'bad' positions for each kind of key on the board. Good positions are encouraged, and bad positions are penalized.
- Both heuristics have their unique characteristics. We found that the material heuristic comparatively resulted in an overall strategy that was attacking in nature. In certain situations, it left the kingfisher without any guard and avoided making any moves to protect it.
- On the other hand, piece-square tables recommended defensive moves and sometimes resulted in an endless loop if the opposite player made consecutive attacking moves.
- Overall, based on multiple runs using different configurations we decided using Piece-Square as our heuristic. Although we used material heuristic for moves made by the opposite player to simulate a opposite player with an attacking strategy.

Problems:

- Competing with other students resulted in situations where both players made same set of repetitive moves. This resulted in non-decisive game.