Makerere University
College of Computing and Information Sciences

School of Computing and Informatics Technology
CS2114: Game playing and Dicesion process

1. (a) Game playing as a concept in search tends to be adversarial in nature. What do you understand by adversarial search ?

   (b) One algorithm that can be used in this kind of search is the Minimax algorithm. Briefly explain how this algorithm works.

   (c) Perform Minimax on the game tree provided in Figure 1. Write the minimax value associated with each letter, A, B, C, D, E, F, and G.
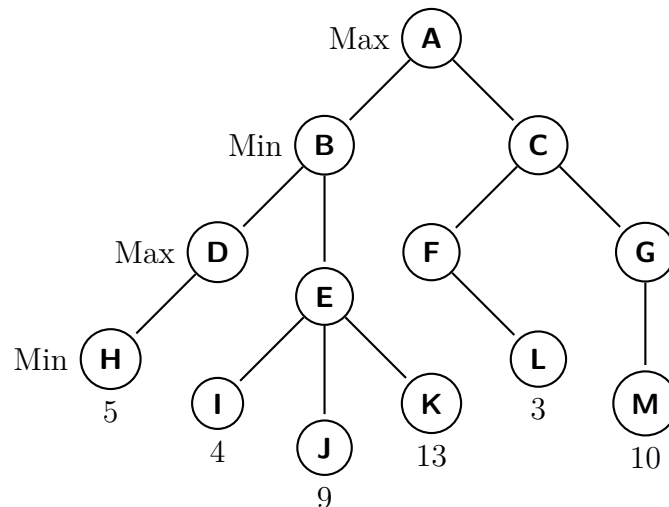

Figure 1: Game tree 1

   (d) Perform Alpha-Beta pruning on the game tree provided in Figure 1. Indicate pruning by striking through the appropriate edge(s) and explain why the pruning that had to take place.

2. Consider the game tree in Figure 2

   (a) What is player's A next move?.

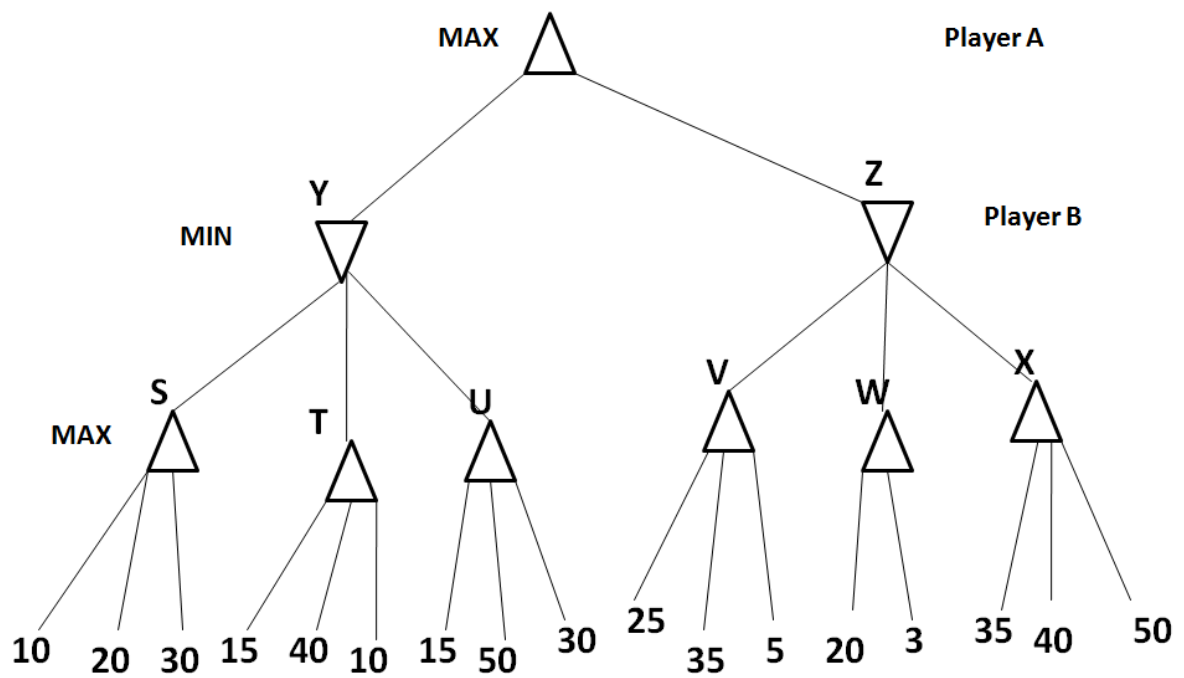   (b) Which nodes would not be visited if Alpha-Beta search is used?

Figure 2: Game tree

3. Consider the game tree in Figure 3 where *A-F* represent some real values. Assume the nodes are explored from left to right and standard alpha beta pruning is used.
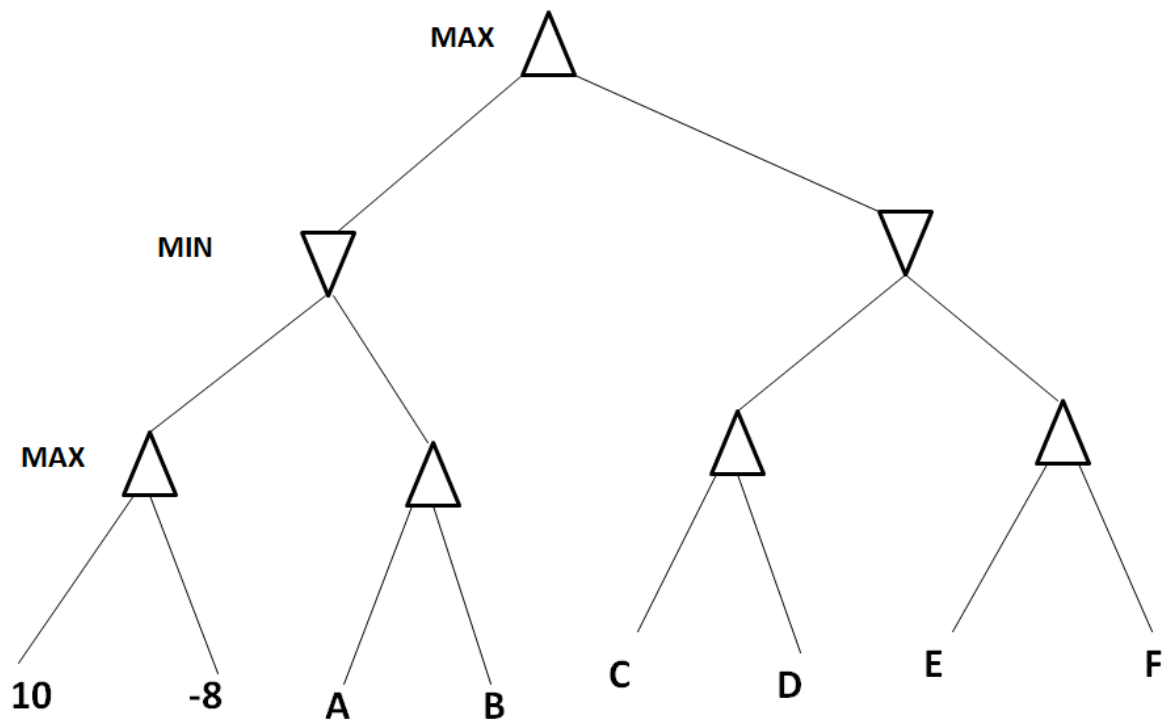

Figure 3: Game tree

(a) Give the value of **A** such that **B** is pruned.

(b) Give the value of **A** such that **B** is not pruned.

(c) There are SOME values of **A** and **B** such that the subtree containing **C** and **D** is pruned. True of False . Explain why?

(d) Assuming that **B=6** and **A= 8**, give a value of C and D such that the subtree containing E and F is pruned.

(e) If you are allowed to assign *A-F* arbitrarily, what is the MAXIMUM number of leaves that can be pruned?

4. Figure 4 shows the game tree of a two-player game; the first player is the maximizer and the second player is the minimizer. Use the tree to answer the following questions.
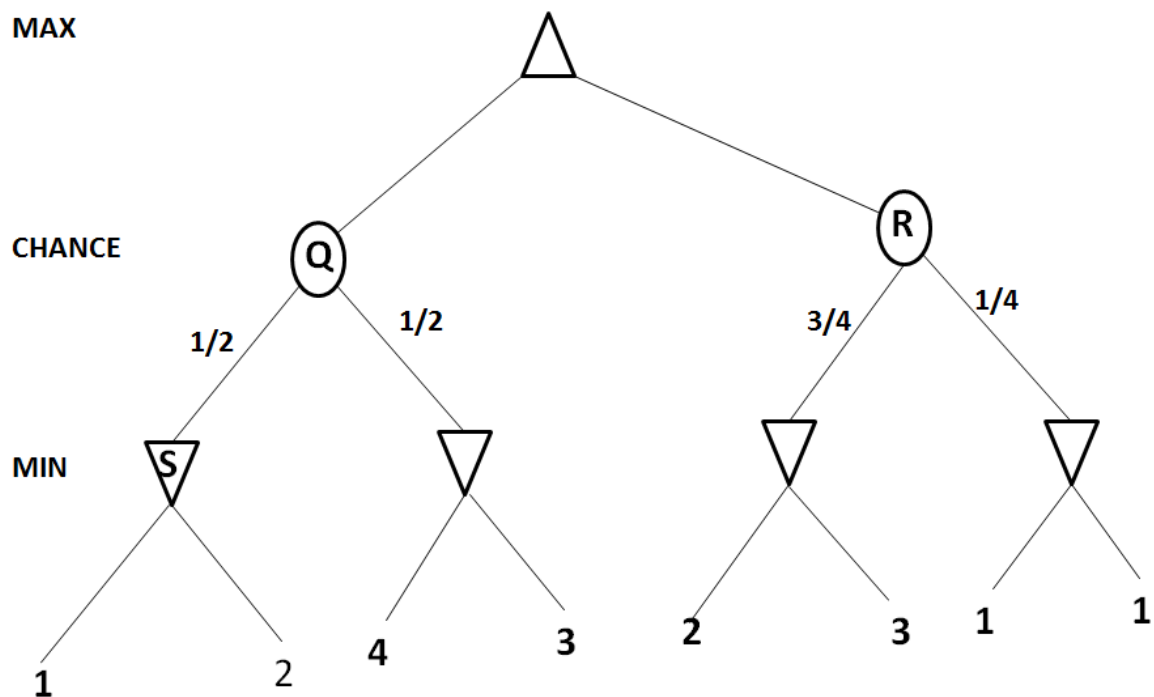

Figure 4: Game tree

(a) What is the value of the node labeled S?

(b) What is the expected values for the nodes labeled Q and R

(c) What is the expected value of the game?

5. Two competing clothing companies, Jane and Jessica, are planning to establish new stores in Kampala to sell more clothing in the neighborhood. But as part of their strategic plan, they have to simultaneously decide what kind of customers they want to target and therefore e what kind of clothing. There are three kinds of two kinds of customers in Kampala neighborhood. One kind prefers to buy office ware clothing

which is more expensive than ordinary clothing. The other prefers to buy cheap clothing and do not care whether office ware or not. Let us call the former type of customers office- ware customers (O) and the latter type Non-Office-ware (N).

Suppose there are 30,000 office-ware customers and 50,000 Non-office-ware customers in Kampala neighborhood. If these two companies favor different types of customers, they will get the maximum amount of each type of customers to visit their stores. But if both companies favor the office-ware customers. Jane will get 3/5 of the office-customers and Jessica will get 2/3 of office-ware customers. In this case, non-office-ware customers will not go to any of the two companies. On the other hand if both companies favor non-office-ware customers, Jessica will get 3/5 of the non-office-ware customers and Jane will get 2/5. Similarly, office-ware customers will not go to any of these companies in this case. Assume the profit for each customer is 1

(a) Write down the matrix of the game

(b) What could be the dominant strategies in this kind of game?

6. Three teams T1, T2 and T3 are competing in a tournament. Past experience shows that T1 has a 25% chance of being in first or second place, T2 has a 5% chance of being in first or second place and T2 with a 40% chance of being in first or second place. Betting information from a betting company indicated that,

- If a person bets on T1 and T1 finish in first or second place that person wins 50000 shilling.

- If a person bets on T2 and T2 finishes first or second place that person wins 100,000 shilling

- If a person bets on T3 and it finishes in first or second place the person wins 20,000 shilling.

a If you are to participate in betting which team would you bet on?

b What is the probability that T2 and T3 would be placed in the first and second places respectively?

7. Table 1 shows driving time on three different routes leading to same destination in particular traffic situations while Table 2 indicate the chances of finding the route in that particular traffic situation.

Table 1: Travel Time

Route	No Traffic	Free	Congested
R1	20	35	60
R2	25	40	50
R3	15	40	70

Table 2: Room Availability

Route	No Traffic	Free	Congested
R1	0.25	0.50	0.25
R2	0.20	0.60	0.20
R3	0.15	0.50	0.35

a What is the expected driving time on each of the routes?

b If these routes all lead to your work place. Which route would you chose? Explain your answer?

End