Name: _____

Student-id: _____

Department: _____

1. [5 points; Dijkstra's Algorithm] Find the shortest path from **node A** to all the other nodes in the graph below. Show the procedure of updating **the data in the priority queue** and **set S (Closed List)**. If key values are the same in the priority queue, choose a node with a preceding alphabet letter (e.g., choose X between X and Y).
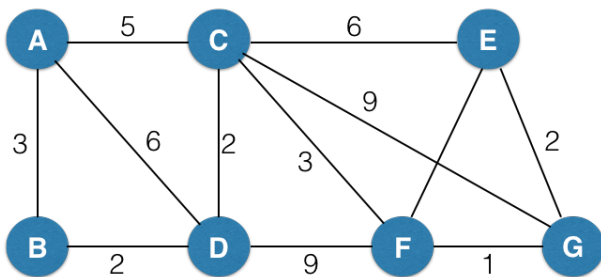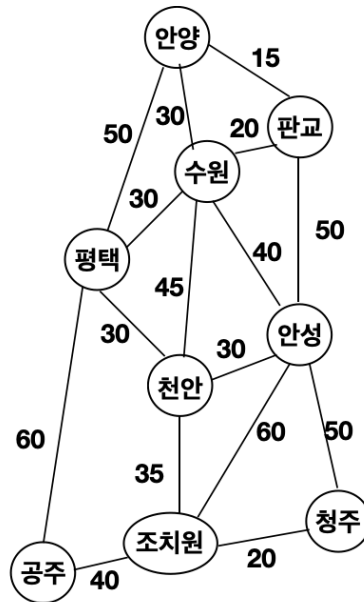

Priority Q:

	A	B	C	D	E	F	G
Initial	**0**	∞	∞	∞	∞	∞	∞
1		**3**	5	6	∞	∞	∞
2							
3							
4							
5							
6							
7							
8							

S = {A,   }

2. [10 Points; A* Algorithm] Find **the shortest route from 판교 to 조치원** using A* algorithm. You should show the contents of **the open list** and **the closed list**, and **f, g, h values** until finding the optimal solution (Note. 우선 순위 큐 내에서 동일한 키 값을 갖는 경우, 가나다 순서로 도시가 선택된다고 가정 - 예: 천안과 조치원이 동일한 키 값일 경우 조치원이 선택)

Straight line distance
From each city to 조치원
(Unit: km)

공주: 25
수원: 80
안성: 45
안양: 95
조치원: 0
천안: 30
청주: 15
판교: 90
평택: 60

3. [10 Points; Alpha-Beta Pruning] Apply the alpha-beta pruning algorithm in the following game tree.
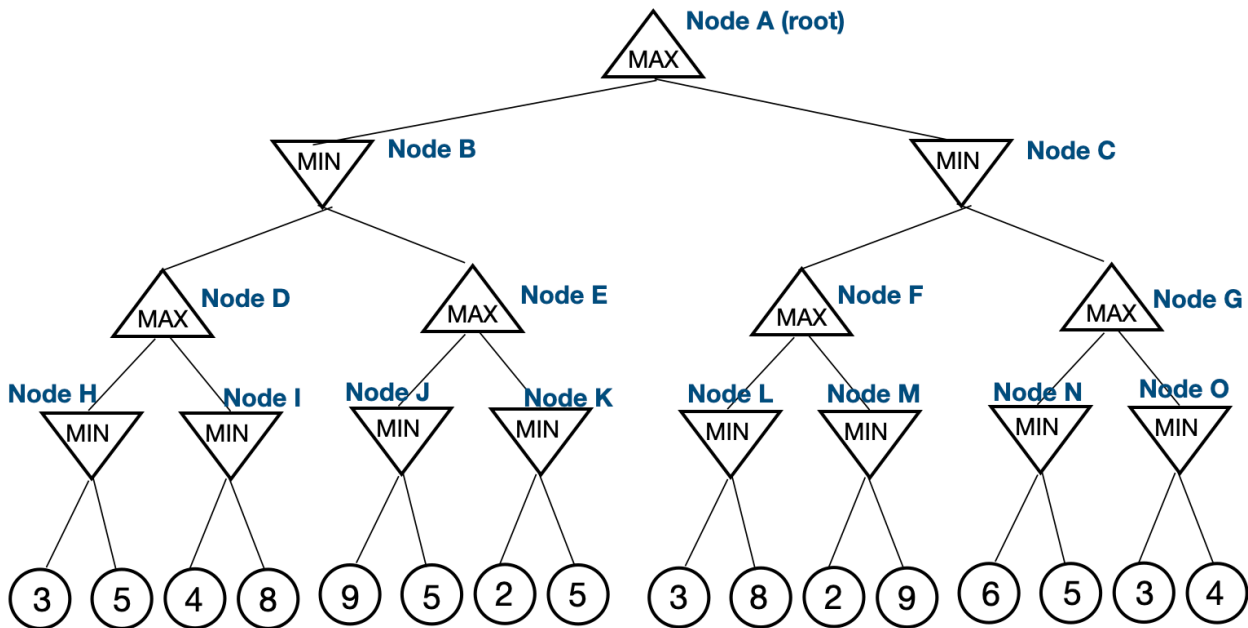
(1) Mark all the nodes that do not need to search. If there is an *internal node* whose leaf nodes are not necessarily to search, mark it as well. Show the procedure of updating **the minimax value (v) at each node**, and **alpha** and **beta** values when necessary (7 pt).

(2) What are the **beta** and the **minimax(v)** values of **node C** when alpha-beta pruning algorithm is over? (3 pt)

4. [10 Points; 2 points each] Answer each question.

(1) "Any algorithm that follows the problem-solving heuristic of making the locally optimal choice at each stage" is called (   )

(2) A scalar value used to train a model via gradient descent. During each iteration, the gradient descent algorithm multiplies it by the gradient, which is also a key hyperparameter. What is it?

(3) What is a node that can have only a single child in behavior trees?

(4) In A* search, heuristics should be "admissible" to find *optimal* solutions. What does it mean by "admissible"? Describe it briefly.

(5) Explain briefly how unsupervised learning is different from supervised learning.