

سوال اول

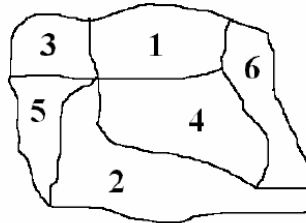
Consider the following set of 8 training examples, each containing two attributes, A and B, and a desired binary classification, + or -. You may leave your answers in (a) – (c) as expressions containing logs of fractions.

A	B	Class
0	10	+
0	100	+
1	100	+
1	10	+
1	100	-
1	100	-
1	10	-
1	10	-

- (a) [3] What is the entropy (information content) of the “Class”?
- (b) [3] What is the information gain (mutual information) of attribute “A” in predicting the “Class”?
- (c) [3] What is the information gain (mutual information) of attribute “B” in predicting the “Class”?
- (d) [6] Draw the final decision tree trained from the above data. Indicate the number of “+” and “-“ training examples at each leaf node, and the class prediction at each leaf.

سوال دوم

Consider the problem of coloring the six areas (numbered 1...6) in the following map using three colors: R, G, and B, so that no adjacent areas have the same color. Two areas are adjacent if they share part of an edge (note: they are NOT adjacent if they only share a corner).

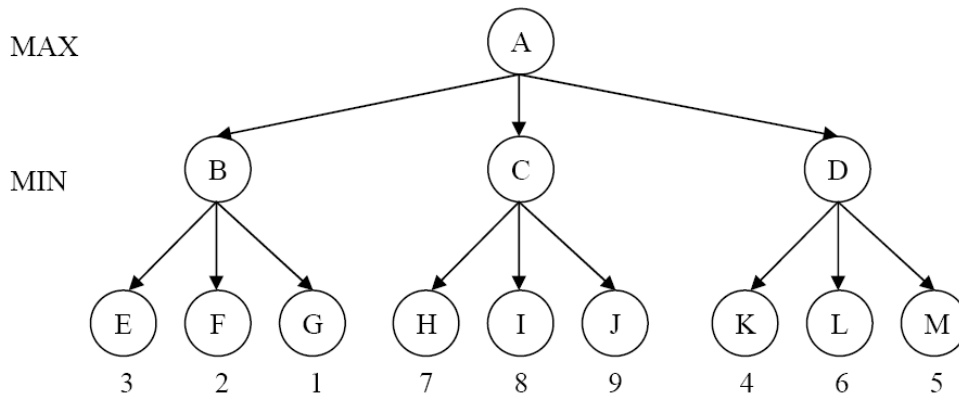


(a) [6] Fill in the table below with the domain of each area after each of the following steps of selecting an area and assigning a color followed by forward checking (FC):

	1	2	3	4	5	6
Initial domain	R,G,B	R,G,B	R,G,B	R,G,B	R,G,B	R,G,B
After 1=R and FC						
After 2=G and FC						
After 3=G and FC						

سوال سوم

Consider the following game tree. The root is a maximizing node, and children are visited left to right.



- (a) [4] Compute the minimax game value of nodes A, B, C, and D using the minimax algorithm.
- (b) [4] Circle all the nodes, or state that none exist, that are not visited by alpha-beta pruning.