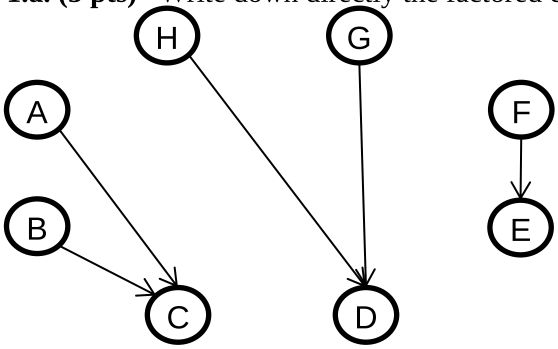
CS 171, Intro to A.I., Winter Quarter, 2020 — Quiz # 3 — 25 minutes

NAME:____ UCINetID ________________________

YOUR ID#: ________ ID# TO RIGHT:__________ ID# TO LEFT:___________ ROW:______ SEAT:_____

1. (40 pts) BAYESIAN NETWORKS

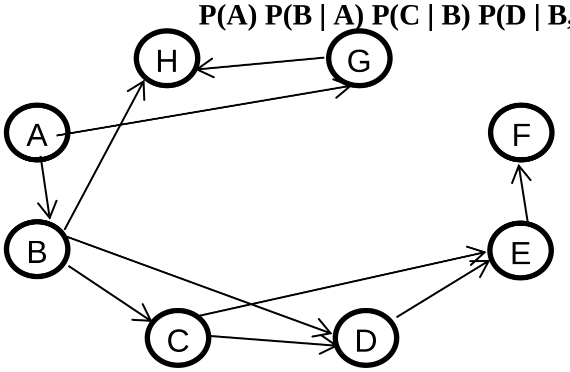
1.a. (5 pts) Write down directly the factored conditional probability expression corresponding to this network:



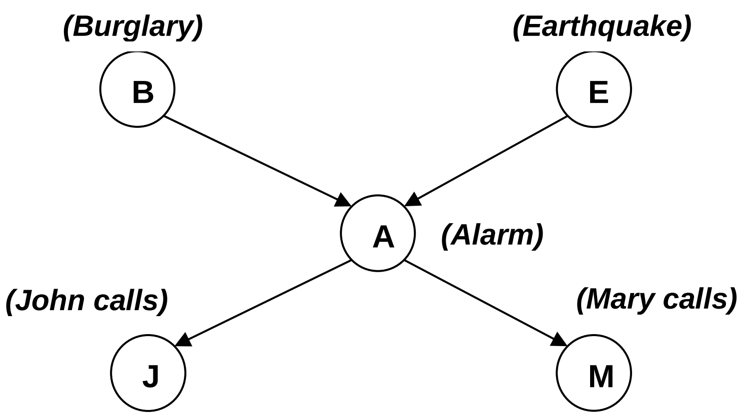
P(A) P(B) P(C | A, B) P(D | H, G) P(E|F) P(F) P(G) P(H)

1.b. (5 pts) Draw the Bayesian Network corresponding to this factored conditional probability expression:

P(A) P(B | A) P(C | B) P(D | B, C) P(E | C, D) P(F | E) P(G| A) P(H | B,G)



1.c. (30 pts, 10 pts each) Shown below is the Bayesian network corresponding to the Burglar Alarm problem, i.e., P(J,M,A,B,E) = P(J | A) P(M | A) P(A | B, E) P(B) P(E). This is Fig. 14.2 in your R&N textbook.



P(B)
.001

P(E)
.002

B	E	P(A)
t	t	.95
t	f	.94
f	t	.29
f	f	.001

A	P(J)
t	.90
f	.05

A	P(M)
t	.70
f	.01

By using the Bayesian Network, evaluate the probability queries. (Use numeric probabilities from the table above, you can either fully evaluate the probability value or show the numeric expression that will be evaluated to the final value.)

(i) P(J=t $\wedge$ M=f $\wedge$ A=f $\wedge$ B=f $\wedge$ E=f) = 0.05*(1-0.01)*(1-0.001)*(1-0.001)*(1-0.002)

(ii) P(J=t $\wedge$ M=t $\wedge$ A=f $\wedge$ B=f $\wedge$ E=f) = 0.05*0.01*(1-0.001)*(1-0.001)*(1-0.002)

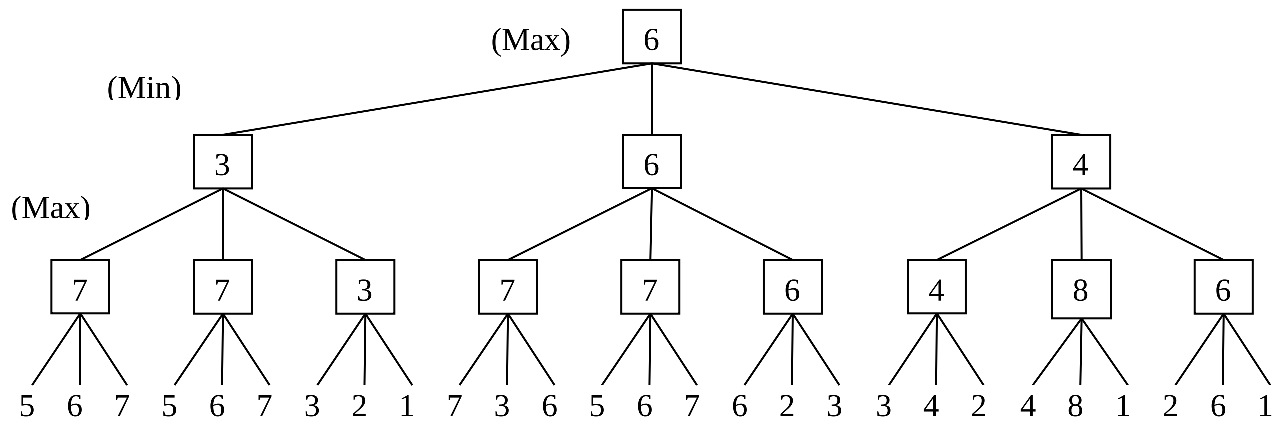
(iii) P(M=t $\wedge$ A=f $\wedge$ B=f $\wedge$ E=f) = 0.01*(1-0.001)*(1-0.001)*(1-0.002)

NAME (Print Darkly & Clearly): ____ UCI NetID: ______________

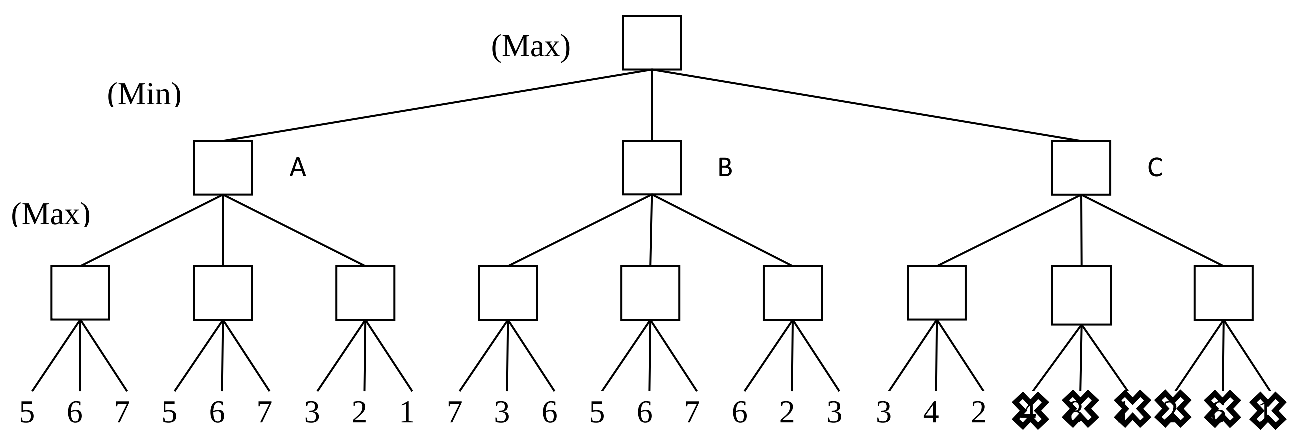
2. (60 pts) GAME TREE SEARCH

The game tree below illustrates a position reached in the game. It is **Max**'s turn to move. At each leaf node is the estimated score of that resulting position as returned by the heuristic static evaluator.

2.a. (10 pts) MINI-MAX SEARCH. Fill in each blank square with the proper mini-max search value.



2.b. (30 pts) ALPHA-BETA PRUNING. Process Tree left to right order, (A, B, C). Cross out each leaf node that will be pruned by Alpha-Beta Pruning. Please explicitly cross out leaf nodes. Don't simply prune branches on your answer.



2.c. (20 pts, 5 pts each) GAME TREE SEARCH. True/False Question.

(i) _F____ In the game tree shown in 2.b, if we processed the nodes in order (B, A, C), we prune less leaf nodes.

(ii) _F____ The best move for the Max at the root may different from Mini-Max search if we prune leaf nodes.

(iii) _F____ The space complexity of Mini-Max search is $O(b^m)$, where b is branching factor and m is the depth.

(iv) _F____ The space complexity of Alpha-Beta pruning is $O(b^m)$, where b is branching factor and m is the depth.