

International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Term Assessment, Spring 2021
Course Code: CSE 3635 Course Title: Artificial Intelligence
Total marks: 30

Time: 4 hours 30 minutes for exam + 30 minutes for submission

[Answer the following questions. Figures in the right hand margin indicate full marks.]

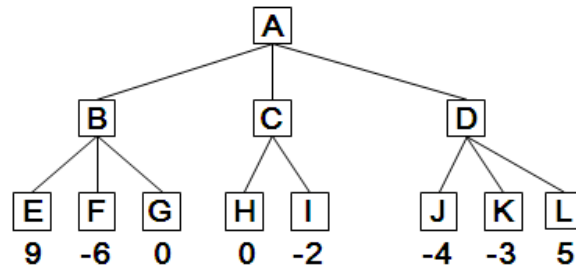
CO DL

1. Consider the following sentences:-

6 CO2 C2

- John likes all kinds of food.
 - Apples are food.
 - Chicken is food.
 - Anything anyone eats and isn't killed by is food.
 - Bill eats peanuts and still alive.
 - Sue eats everything Bill eats.
- i) Translate these sentences into formulas in predicate logic.
 - ii) Prove that John likes peanuts using backward chaining.
 - iii) Convert the formula into clause form.
 - iv) Prove that "John likes peanuts" using resolution.

2. a) Apply Alpha-beta search procedure on following game tree. Suppose the first player is the maximizing player.



- (i) Suppose the first player is the maximizing player. What move should be chosen?
- (ii) In the game tree, what nodes would not need to be examined using the alpha-beta pruning procedure?

4 CO3 C3

b) Given knowledge base R1, R2, R3, R4, R5 below, show that P1,2 is false.

2 CO5 C5

- R1: $\sim P_{1,1}$
R2: $B_{1,1} \Leftrightarrow (P_{2,1} \vee P_{1,2})$
R3: $B_{2,1} \Leftrightarrow (P_{1,1} \vee P_{2,2} \vee P_{3,1})$
R4: $\sim B_{1,1}$
R5: $B_{2,1}$

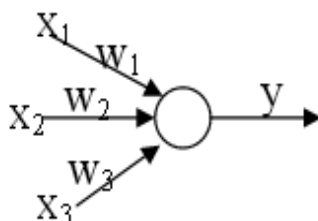
3. a) What is Artificial Neural Network? Show with diagram. Compare artificial and biological network.

2 CO2 C2

b) Find Y for the following neuron if Input $X_1=0.5$, $X_2=0.2$, $X_3=0.7$ And weight $W_1=0.1$, $W_2=0.3$ and $W_3=0.6$

4 CO5 C5

- i) Compute the value of Y without a transfer function
- ii) Compare the value of Y with a threshold function. If the value is 0.5 or less, call it 0; otherwise call it 1.
- iii) Compute the value of Y with the sigmoid transfer function



4. a) Write down the parse tree for the sentence “Kawsar wrote the program” using the following simple grammar for a fragment of English in Figure 1. 2 CO3 C3

$S \rightarrow NP VP$
 $NP \rightarrow the NP1$
 $NP \rightarrow PRO$
 $NP \rightarrow PN$
 $NP \rightarrow NP1$
 $NP1 \rightarrow ADJS N$
 $ADJS \rightarrow \epsilon | ADJS ADJS$
 $VP \rightarrow V$
 $VP \rightarrow V NP$
 $N \rightarrow file | program$
 $PN \rightarrow Kawsar$
 $PRO \rightarrow I$
 $ADJ \rightarrow short | Long | fast$
 $V \rightarrow printed | Created | wrote$

Figure 1. A simple grammar for a fragment of English

- b) Determine whether the following sentence is i) Satisfiable ii) Contradictory iii) Valid 2 CO3 C3
 $(P \vee Q) \rightarrow (P \& Q)$
- c) Transform the following sentence into Conjunctive Normal Form (CNF): $(P \rightarrow Q) \rightarrow R$ 2 CO3 C3
5. A Bayesian network (Figure 2) with Boolean variables B = BrokeElectionLaw, I = Indicted, M = PoliticallyMotivatedProsecutor, G = FoundGuilty, J = Jailed, showing both the topology and the conditional probability tables (CPTs). 6 CO3 C3

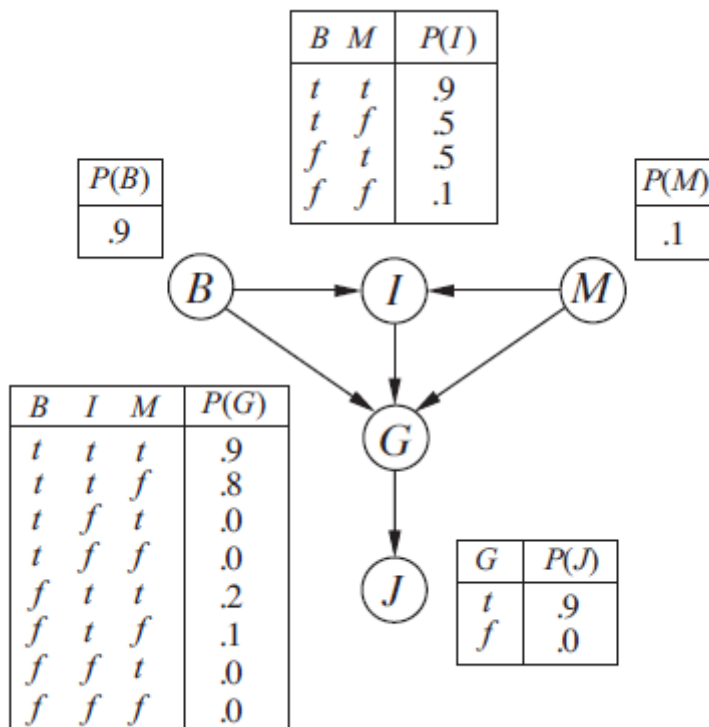


Figure 2

- Calculate the value of $P(b, i, m, g, j)$
- Calculate the probability that someone goes to jail given that they broke the law, have been indicted, and face politically motivated prosecutor.
- Suppose we want to add the variable P = PresidentialPardon to the network, draw the new network and briefly explain any links you add.