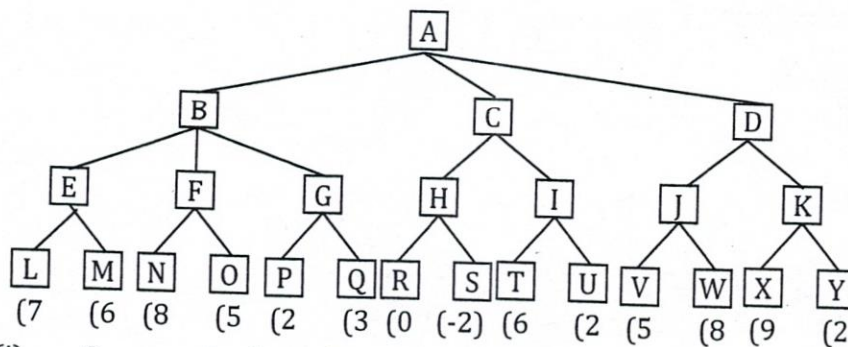


International Islamic University Chittagong
Department of Computer Science and Engineering
B. Sc. in CSE Final Examination, Autumn 2021
Course Code: CSE 3635 Course Title: Artificial Intelligence
Total marks: 50
Time: 2 hours 30 minutes

Answer the following questions. The figures in the right hand margin indicate full marks.

Part A

1. a) Why First Order Predicate Logic is considered as the generalization of Propositional Logic? CO1 2
1. b) State the pros & the cons of Forward chaining and Backward chaining. CO1 4
- Or**
1. b) Consider the following axioms: CO1 4
- P(1)
 $(P \wedge Q) \rightarrow R$ (2)
 $(S \vee T) \rightarrow Q$ (3)
 T(4)
- (i) Convert the formulas into clause form
 (i) Prove that whether R is true or not by using propositional resolution.
- 1 c) Consider the following facts: CO2 4
- (1) Marcus was a man. (2) Marcus was a Pompeian. (3) Marcus was born in 40 A.D.
 (4) All men are mortal. (5) All Pompeian died when the volcano erupted in 79 A.D.
 (6) No mortal lives longer than 150 years. (7) It is now 2014. (8) Alive means not dead. (9) If someone dies, then he is dead at all later times.
- Translate these facts into well-formed formulas (wffs) in predicate logic.
 - Answer the question "Is Marcus alive now?" using backward reasoning.
 - Convert the formula into clause form.
 - Prove that "Marcus is not alive now" using resolution.
2. a) Is the minimax procedure a depth-first or breadth-first search procedure? CO1 1
2. b) Describe the minimax search procedure. CO2 4
2. c) CO4 5



- (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?

Or

2. c) Trace the constraint satisfaction procedure solving the following crypt-arithmetic problem:

$$\begin{array}{r}
 \text{S E N D} \\
 + \text{M O R E} \\
 \hline
 \text{M O N E Y}
 \end{array}$$

CO4 5

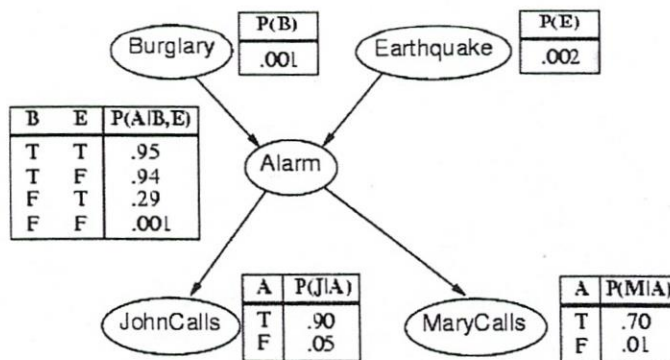
Initial State:

No two letters have the same value.

The sums of the digits must be as shown in the problem.

Part B

3. a) Identify planning in the AI. CO2 2
3. b) Demonstrate Goal Stack Planning. CO2 3
- Or**
3. b) Write down the preconditions of the following operators: (i) UNSTACK (A,B), (ii) STACK(A,B), (iii) PICKUP(A) and (iv) PUTDOWN(A). CO2 3
3. c) Develop an effective and complete plan using STRIPS approach (or any other approaches of your choice) to convert given initial state into goal state. CO2 5
4. a) What is Baye's theorem? CO1 1
4. b) Taking account of the example below, explain the concept of uncertainty.
The doorbell rang at 12'0 clock in the midnight.
Was someone there at the door?
Did Karim wakeup? CO2 2
4. c) A doctor knows that the disease meningitis causes the patient to have a stiff neck, say, 40% of time. The doctor also knows some unconditional facts: the prior probability that a patient has meningitis is 1/50000, and the prior probability that any patient has a stiff neck is 1/25. Find the probability of patients with a stiff neck to have meningitis. CO2 2.5
4. d) A Bayesian network (Figure 1), showing both the topology and the conditional probability tables (CPTs). In the CPTs, the letters B, E, A, J and M stand for Burglary, Earthquake, Alarm John Calls, and MaryCalls, respectively. The Independent conditional probability help us to write in a simplified way the joint distribution $P(B, E, A, J, M)$. CO3 4.5

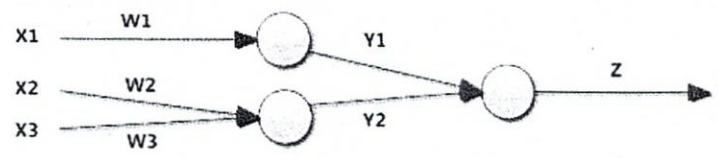


- i) Express the joint distribution $P(F, E, A, Y, S)$ in terms of the conditional probabilities (and independencies) expressed in the Bayesian Network above.
- ii) Probability of the event that the alarm has sounded but neither a Burglary nor an earthquake has occurred and both Mary and John call.
- iii) Probability of the event that the alarm has sounded and Burglary has occurred, an earthquake has not occurred and both Mary and John call.
5. a) Compare artificial and biological networks. What aspects of biological networks are not CO2 2

40

CO1 3
CO4 5

- mimicked by artificial ones? What aspects are similar?
5. b) Write down the steps through which NLP is conducted.
 5. c) Review this neural network and compute Z.



Where $X1 = 15$, $X2 = 8$, $X3 = 14$, $W1 = 0.6$, $W2 = 0.3$, $W3 = 0.1$, weight for $Y1 = 0.6$, weight for $Y2 = 0.45$

- a) Compute the value of Z without a transfer function
- b) Compare the value of Z with a threshold function. If the value is 5 or less, call it 0; otherwise call it 1.

Compute the value of Z with the sigmoid transfer function used at all neurons.

Or,

- 5 a) Give your realization on inductive learning method with necessary example.
- 5 b) Analyze the syntax and semantics of Bayesian Belief Network.
- 5 c) Interpret how domain knowledge is represented in Expert System. Contrast two essential capabilities of an Expert System.

CO2 2
CO1 4
CO4 4