U21CS081

Computer Science and Engineering Department, SVNIT, Surat.
End Semester Examination, April-2024
B.TECH-III, Semester-VI
Course: Artificial Intelligence(CS304)

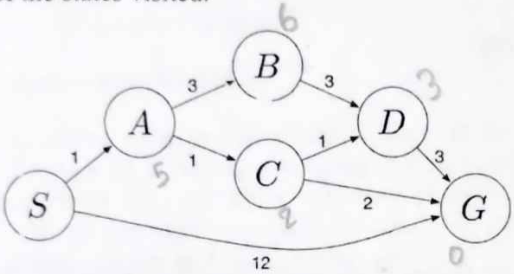
Date:16/04/2024 **Time-9:00 am to 12:00 pm** **Total Marks-50**

Instructions:

1. Write your B.Tech Admission No/Roll No and other details clearly on the answer books and on the question paper..
2. Assume any necessary data but give proper justifications.
3. Be precise and clear in answering the questions.

Q-1 Answer the followings : **[30]**

A. Answer the following questions about the search problem shown below as per the sequences of the states visited.

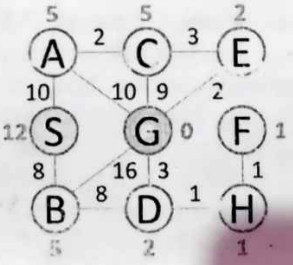


State	h_1	h_2
S	5	4
A	3	2
B	6	6
C	2	1
D	3	3
G	0	0

1) Which one out of h1 and h2 is admissible? Why?
2) Which one out of h1 and h2 is consistent? Why?
3) explain which path A* method would return using a consistent heuristic?

B. With suitable example, explain how iterative deeping search will perform better over depth first search. Can iterative deeping search performs worse than depth first search? Justify your answer.

C. Write and discuss SMA* algorithm. Derive steps to show, how we can optimizes SMA* to work within reduced memory for the following problem (Memory : 4 nodes)



D. Explain disadvantage of MINMAX method and how is it possible to compute the correct minimax decision using Alpha–beta pruning? With suitable examples and diagrams trace the

steps taken by both the methods and clearly compare the drawbacks (minimax) and advantages (Alpha–beta pruning) of both the processes.

E. Explain constraint satisfaction algorithm. How we can use it to solve the following cryptarithmetic problem. Mention appropriate steps to show how the solution proceeds in cycles corresponding to the algorithm.

Problem:

```
  SEND
+ MORE
.....
 MONEY
```

Initial State:

No two letters have the same value.
The sums of the digits must be as shown in the problem.

F. Explain augmented transition network (ATN) in NLP. With a suitable diagram show how a single ATN can be expanded to recognize both non passive and passive sentences. Show the ATN grammar in both the cases.

OR

F. Explain following w.r.t NLP:
1. N-grams model
2. Add one Smoothing

Q-2 Answer the followings: **[13]**

A. For each of the following sentences in English, decide if the accompanying first-order logic sentence is a good translation. If not, explain why not and correct it. **[03]**

1. Any apartment in London has lower rent than some apartments in Paris.
   $\forall x[Apt(x) \wedge In(x,London)] \Rightarrow \exists y([Apt(y) \wedge In(y,Paris)] \Rightarrow (Rent(x) < Rent(y)))$
2. There is exactly one apartment in Paris with rent below $1000.
   $\exists x Apt(x) \wedge In(x,Paris) \wedge \forall y[Apt(y) \wedge In(y,Paris) \wedge (Rent(y) < Dollars(1000))] \Rightarrow (y=x)$
3. If an apartment is more expensive than all apartments in London, it must be in Moscow.
   $\forall x Apt(x) \wedge [\forall y Apt(y) \wedge In(y,London) \wedge (Rent(x) > Rent(y))] \Rightarrow In(x,Moscow)$.

B. Consider the following axioms. Convert them in FOPL. Use resolution and prove the conclusion that "If Santa has some reindeer with a red nose, then every child loves Santa". **[03]**

1. Every child loves anyone who gives the child any present
2. Every child will be given some present by Santa if Santa can travel on Christmas eve.
3. It is foggy on Christmas eve.
4. Anytime it is foggy, anyone can travel if he has some source of light.
5. Any reindeer with a red nose is a source of light.

C. Differentiate between forward and backward chaining. [03]

OR

C. What is reasoning? Discuss Inductive Reasoning in detail with an example. [03]

D. The following are the given facts. Use a forward chaining method to reach the given goal. Draw necessary diagram. Explain step wise. [04]

1. It is crime for Americans to sell the weapon to the enemy of America
2. Country Nono is an enemy of America
3. Nono has some Missiles
4. All missiles were sold to Nono by Colonel
5. Colonel is American
6. Missile is a weapon

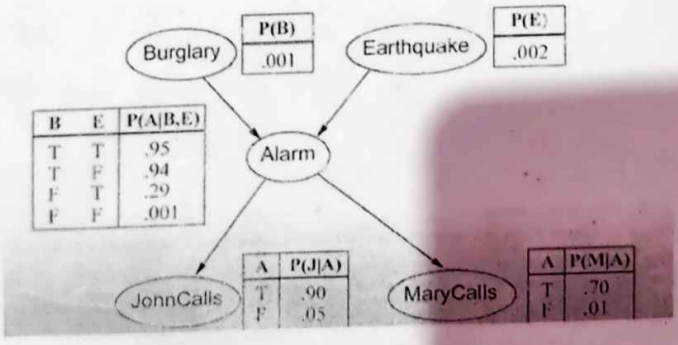
Goal :

"Colonel is a criminal."

Q-3 Answer the followings: [07]

A. You have installed a new burglar alarm at your home to detect burglary. The alarm reliably responds at detecting a burglary but also responds for minor earthquakes. You have two neighbors John and Mary, who have promised to call you at work when they hear the alarm. John always calls you when he hears the alarm, but sometimes he gets confused with the phone ringing and calls at that time too. On the other hand, Mary likes to listen to high music, so sometimes she misses hearing the alarm. Given the evidence of who has or has not called, compute the probability of Burglary Alarm. [04]

1. What is the probability that the alarm has sounded but neither the burglary nor an earthquake has occurred and both John and Mary call?
2. What is the probability that John called?



B. Discuss the role of planning in AI. Explain Hierarchical Planning in detail. Draw necessary diagram. [03]