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CSE401 Enrol. No. 26

[ET]

END SEMESTER EXAMINATION : APRIL-MAY, 2024

ARTIFICIAL INTELLIGENCE

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five**.

Each question carries **06** *marks*.

1. (a) Explain the term Uncertainty, and how it is handled while designing an expert system? (3)

(b) Differentiate between:

(i) monotonic and non monotonic reasoning

(ii) Inductive and deductive learning (3)

P.T.O.

2. Write the steps taken to Apply Bag of words (BOW) method to the following sentences and convert to the vector form:

Sentence 1: This book is very scary and long

Sentence 2: This book is not scary and also not interesting

Sentence 3: This book is intersetting and thrilling

Sentence 4: This book is an interesting thriller

3. Discuss major components of the context free grammar. A simple CFG for a fragment of English,

S-> NP VP
NP-> N | ART N | ART ADJ N
VP -> V | V NP | V VP | ADV V

Derive a parse tree for given sentences by using the these rules:

(i) Using top-down parsing

(ii) Using bottom-up parsing

The Raj sat on the mat to drink milk.

4. (a) Explain the architecture of an expert system. (3)

(b) Discuss Roles of sensors and five popular types of sensors used in robotics. (3)

5. Write the difference between forward and inverse Kinematics. Translate the link [A (8, 10), B (8, 15), C(12, 10), D(12, 15)] 3 units in x direction and 4 unit in y direction.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three**.

Each question carries **10** *marks.*

6. (a) Perform the following tasks:

(i) show that $\neg(p \rightarrow q) \leftrightarrow (p \wedge \neg q)$ is a tautology.

(ii) show that $(\neg a \rightarrow b) \wedge (\neg b \vee (\neg a \vee \neg b))$ is logically equivalent to $\neg(a \leftrightarrow b)$. (3)

(b) Draw the State space diagram and use the steepest ascent hill climbing search algorithm to solve the given 8 puzzles. Consider the Sum of Manhattan distances of the tiles from their goal positions as a heuristic function.

2	8	3
1	6	4
7		5

Initial State

1	2	3
8		4
7	6	5

Final State

Identify the common issues related to steepest ascent hill climbing? Does any problem is observed in the given problem. (7)

7. (a) Draw the conceptual dependency for following:

1. John grew the plants with fertilizer.

2. John ate ice-cream with a spoon.

3. John was sad because Mary hit him.

4. When Fred gave Mary a peach she ate it.

5. John killed his brother by shooting him in the head. (5)

(b) Explain the advantages of a partitioned semantic net over a semantic net. Draw the partitioned semantic net for the following statement,

Rita gave an examination of the operating system.

Every student has taken an examination.

Every student has taken every examination.

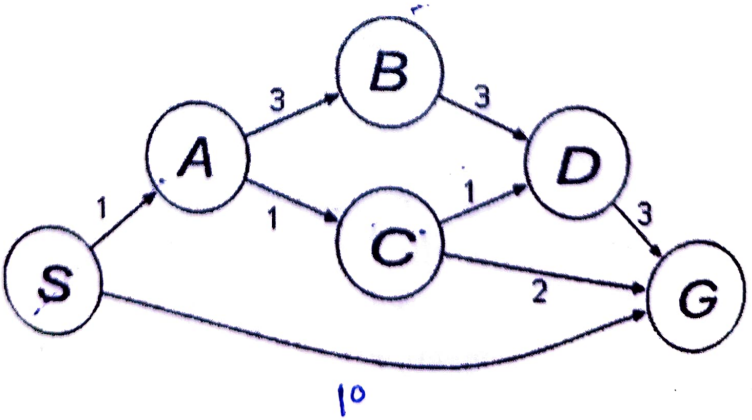
8. (a) An insurance company insured 2000 scooter drivers, 4000 car drivers, and 6000 fruck drivers. The probability of an accident involving a scooter driver, car driver, and a truck is 0.01, 0.03, and 0.015 respectively. One of the insured persons meets with an accident. What is the probability that he is a scooter driver? (5)

(b) A single cubic trajectory is given by $\theta(t) = 10 + 90t^2 - 60t^3$ and is used over the time interval from t = 0 to t = 1. What are the starting and final positions, velocities, and accelerations? (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Write the A* algorithm for the path identification. Discuss the conditions for optimality of A* algorithm. For the given graph, find the path from S to G using



(i) breadth-first search

(ii) Table below gives two possible values of heuristics. Give path for both cases using A* graph search

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

(8)

(b) Consider the following facts:

(i) Anyone passing his history exams and winning the lottery is happy.

(ii) Anyone who studies or is lucky can pass all his exams.

(iii) Vijay did not study but he is lucky.

(iv) Anyone who is lucky wins the lottery.

Convert the above sentence to clause form and use the Resolution Approach to prove that Vijay is happy! **(8)**