Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2024

IT3CO30 Artificial Intelligence

Programme: B.Tech. Branch/Specialisation: IT

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. A production system consists of rule in form of rule ->..... **1**

(a) Game Playing (b) Action (c) Plan (d) Understand

ii. Which is true regarding BFS? **1**

(a) BFS will get trapped exploring a single path

(b) The entire tree so far been generated must be stored in BFS

(c) BFS does not guarantee to find a solution, if exists

(d) BFS is nothing but Binary First Search

iii. The OPEN list in A* algorithm is a- **1**

(a) Double link list (b) Priority queue

(c) Circular link list (d) Stack

iv. The heuristic function in A* is calculated as f(n)= g(n) + h(n), where n is any node in solution space, here g(n) and h(n) specifies- **1**

(a) Distance or cost from root to n and Estimated cost from n to goal

(b) Cost of getting the root node

(c) Cost of traversing in BFS fashion

(d) None of the above

v. ((a OR b) OR c) ≡ (a OR (b OR c)), this is logical equivalence by the rule of: **1**

(a) Associativity (b) Commutativity

(c) De-Morgan Law (d) Distributivity

vi. The English translation of the following predicate is- **1**

$\forall x \text{ men}(x) \rightarrow \text{drink}(x, \text{coffee})$

(a) All men drink coffee (b) Not all men drink coffee

(c) Some men drink coffee (d) Some men do not drink coffee

vii. According to Bayes' Rule, posterior density calculation depends upon- **1**
(a) Prior probability, class conditional probability, evidence
(b) Class conditional probability, evidence
(c) Prior probability, evidence
(d) None of these

viii. Which kind of reasoning is required to reason with real world changing situations? **1**
(a) Monotonic reasoning
(b) Understanding
(c) Non-monotonic reasoning
(d) Planning

ix. A problem in a search space Is defined by- **1**
(a) Initial state (b) Goal state
(c) Intermediate states (d) Both (a) and (b)

x. Minimax follows which one of the following searching strategy: **1**
(a) DFS (b) BFS
(c) Hill climbing (d) Best first search

Q.2 i. List down any four task domain of AI. Explain anyone. **2**
ii. Compare depth first search and breadth first search under six points. **3**
iii. What is production system? What are its characteristics? **5**
OR iv. Explain types of production system with example. Discuss its advantages and disadvantages. **5**

Q.3 i. Apply Constraint Satisfaction to solve following cryptarithmetic problem: **4**
SEND+MORE=MONEY
ii. Enumerate classical eight puzzle problem with A* algorithm. Clearly explain the calculation of f(n)=g(n)+h(n) for each node. **6**
OR iii. Write an algorithm for AO*. Explain through an example. **6**

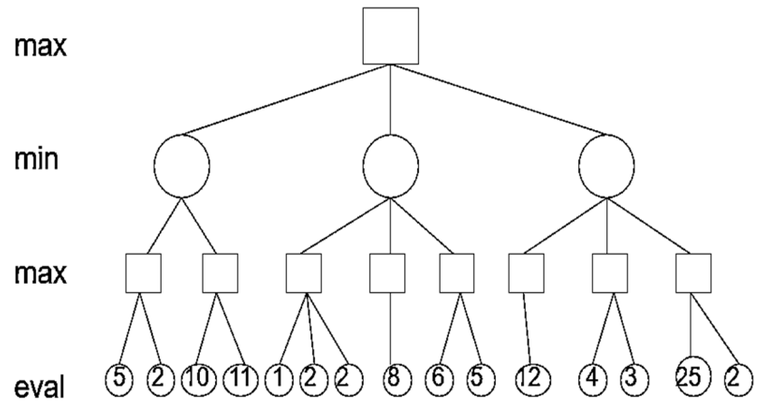
Q.4 i. Compare forward and backward chaining. **4**
ii. Define semantic net and frame. Draw a neat semantic net for following scenario- **6**
Tom is a cat. Tom caught a bird. Tom is owned by John.

Tom is ginger in colour. Cats like cream. The cat sat on the mat. A cat is a mammal. A bird is an animal. All mammals are animals. Mammals have fur.

OR iii. Prove the Goal: "Tom eats deer" with the help of resolution-refutation proofs, consider following statements given in knowledge base. **6**
(a) Tiger likes deer.
(b) Tiger eats everything they like.
(c) Tom is a Tiger.

Q.5 Attempt any two:
i. Compare monotonic and nonmonotonic reasoning. **5**
ii. What is Bayes theorem? How it is used for classification? **5**
iii. What is decision tree? Explain through example. Discuss the entropy and information gain through formulae. **5**

Q.6 Attempt any two:
i. Discuss the block world problem's solution using AI agent. **5**
ii. Discuss Minimax procedure with the help of example. Discuss its properties. **5**
iii. Solve alpha-beta pruning for following tree- **5**



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Marking Scheme

IT3CO30_Artificial Intelligence

Q.1 i) A production system consists of rule in form of rule ->..... **1**
b) Action

ii) Which is true regarding BFS? **1**
b) The entire tree so far been generated must be stored in BFS

iii) The OPEN list in A* algorithm is a **1**
b) Priority queue

iv) The heuristic function in A* is calculated as f(n)= g(n) + h(n), where n is any node in solution space, here g(n) and h(n) specifies **1**
a) Distance or cost from root to n and Estimated cost from n to goal

v) ((a OR b) OR c) ≡ (a OR (b OR c)), this is logical equivalence by the rule of: **1**
a) Associativity

vi) The English translation of this predicate is ∀x men(x) → drink (x, coffee) **1**
a) All men drink coffee.

vii) According to Bayes' Rule, posterior density calculation depends upon **1**
a) Prior Probability, Class Conditional Probability, Evidence

viii) Which kind of reasoning is required to reason with real world changing situations **1**
c) Non-Monotonic Reasoning

ix) A problem in a search space Is defined by **1**
d) Both a and b

x) Minimax follows which one of the following searching strategy? **1**
a) DFS

Q.2 i. List down any 4 marks task domain of AI. Explain any 1. **2**
1 mark for list, 1 mark for explanation.

ii. Compare Depth first search and Breadth first search under 6 points. **3**
1 point for 2 marks comparision

iii. What is production system? 3 marks **5**
What are its characteristics? 2 marks

OR iv. Explain types of production system with example. 3 marks **5**
Discuss its advantages and disadvantages. 2 marks

Q.3 i. Apply Constraint Satisfaction to solve following cryptarithmetic problem: **4**

SEND+MORE=MONEY

Complete solution S=9,M=1, O=0, E=5 marks ,
N=6, R=8, D=7
Y=2 marks

ii. Enumerate classical 8 puzzle problem with A* algorithm. **6**
Clearly explain the calculation of f(n)=g(n)+h(n) for each node.

OR iii. Write an algorithm for AO*. 3 marks **6**
Explain through an example. 3 marks

Q.4 i. Compare forward and backward chaining. **4**
1 mark for each point

ii. Define semantic net and frame. 1.5 marks -1.5 marks **6**
Draw a neat semantic net for following scenario- 3 marks

Tom is a cat. Tom caught a bird. Tom is owned by John.
Tom is ginger in colour. Cats like cream. The cat sat on the mat. A cat is a mammal. A bird is an animal.
All mammals are animals. Mammals have fur.

OR iii. Prove the Goal: "Tom eats deer" with the help of resolution-refutation proofs, consider following statements given in knowledge base. **6**
1. Tiger likes deer.
2. Tiger eats everything they like.
3 . Tom is a Tiger.
Complete proof.-6

Q.5 i. Compare monotonic and nonmonotonic reasoning? **5**
1 marks mark for 1 marks point

ii. What is Bayes Theorem? 3 marks **5**
How it is used for classification? 2 marks

OR iii. What is decision tree? 2 marks **5**
Explain through example? 1 marks
Discuss the entropy and information gain through formulae. 2 marks

Q.6

i. Discuss the block world problem's solution using AI agent. 5 marks **5**

ii. Discuss Minimax procedure with the help of example. 3 marks **5**
Discuss its properties. 2 marks

iii. Solve alpha-beta pruning for following tree- 5 marks

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