610405/610905

B.TECH. VI SEM MAIN/BACK EXAM AUGUST 2023
COMPUTER SCIENCE AND ENGINEERING
(6CS4-05) - ARTIFICIAL INTELLIGENCE
COMMON WITH CSE & IT

Time : 2 Hours]

[Max. Marks : 80

[Min Passing Marks :

Instructions to Candidates : Part – A: Short answer questions (up to 25 words) 5 × 2 marks = 10 marks. All 5 questions are compulsory.

Part – B: Analytical/Problem Solving questions 4 · 10 marks = 40 marks. Candidates have to answer 4 questions out of 6.

Part – C: Descriptive/Analytical/Problem Solving questions 2 · 15 marks = 30 marks. Candidates have to answer 2 questions out of 3.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting materials is permitted during examination. (Mentioned in form No. 205)

1_____   2_____

PART A

1. Describe search spaces where DFS works better than BFS.   [2]

2. Explain cryptarithmetic problem.   [2]

3. Explain activation functions with respect to neural networks.   [2]

4. Explain inductive learning with examples.   [2]

5. Check whether the following WFF is valid :   [2]

$$(P \vee Q) \wedge (Q \vee R) \Rightarrow (P \vee R).$$

6. Construct Decision tree for the following dataset. [10]

Example	Fever	Vomiting	Diarrhea	Shivering	Classification
d1	no	no	no	no	H
d2	average	no	no	no	I
d3	high	no	no	yes	I
d4	high	yes	yes	no	S
d5	average	no	yes	no	S
d6	no	yes	yes	no	B
d7	average	yes	yes	no	B

7. Consider the following statements [10]

   (a) John likes all kinds of food. Apples are food. Chicken is food. Anything anyone eats and is not killed by is food. Bill eats peanuts and is still alive. Sue eats everything Bill eats.

   (b) Translate these sentences into formulas in predicate logic.

   (c) Prove that John likes peanuts using backward chaining.

   (d) Convert the formula into clause form.

   (e) Prove that John likes peanuts using resolution.

8. Design perceptrons for the following : [10]

   (a) 3-input AND

   (b) 3-input OR

   (c) 2-input NAND

   (d) 2-input NOR.

9. Nim is a 2-player game. The game starts with a stack of 7 tokens. At each move, a player selects one stack and divides it into two non-empty non-equal stacks. A player who is unable to move losses the game. Draw the complete search tree from Nim. If both min and max play the game perfectly, who will win ? Explain your answer. [10]

10. A farmer is on one side of the river with a boat, a wolf, a goat and a cabbage. The farmer is trying to get everything on the other side of the river. Only the farmer can handle the boat and there is space only for one more item. The farmer cannot leave the goat with the cabbage or the wolf. Model the state with 4 bits (boat, wolf, goat, cabbage), where 1 means the item is on the current bank and 0 mean it is on the other bank. List all possible rules and assumptions. Find a path from 1111 to 0000 using an appropriate search algorithm. List the forbidden states. [10]

11. Give two application areas of robotics. How a robot gets various sensory information? Discuss image understanding process in robotics. [10]

PART C

12. Answer the following questions :

   (a) Why should we build a large knowledge base ? [4]

   (b) Describe the implementation issues of a non-monotonic reasoning system. [5]

   (c) What are the key issues to be addressed in a non-monotonic system. [6]

13. Answer the following questions :

   (a) Explain conceptual dependency along with its goals and representation. [8]

   (b) Write a note on the water jug problem using production rules. [7]

14. Answer the following questions :

   (a) Explain A* algorithm with an example [10]

   (b) Explain forward chaining with an example. [5]