USN : 2GI20IS011 Course Code : 18IS61

Sixth Semester B.E. Semester End Examination, JUNE_AUGUST_2023

ARTTIFICIAL INTELLIGENCE

Time: 3 hrs. Max. Marks :100

Instructions :1. Answer any FIVE full Questions selecting at least ONE Question from Each Module.

MODULE 1

	L	CO	PO	M

1a. Define the following
- i) Intelligence.
- ii) Artificial Intelligence.
- iii) Agent.
- iv) Rationality.
- v) Logical Reasoning

[2] [1] [1] [10]

1b. Consider a water jug problem. You are given two jugs, a 4-gallon and a 3-gallon jugs. Neither has any measuring mark on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallon of water into a 4-gallon jug? State the production rules for the water jug problem.

[3] [1] [2] [10]

OR

2a. Explain with neat diagram.
- i) Goal based Agents.
- ii) Utility based Agents.

[2] [1] [2] [10]

2b. For each of the following activities, give a P(Performance), E(Environment), A(Actuators), S(Sensors) description of the task environment.
- i) Taxi Driver.
- ii) Satellite image analysis system.
- iii) Part-picking Robot.
- iv) Medical diagnosis system.

[3] [1] [1, 2] [10]

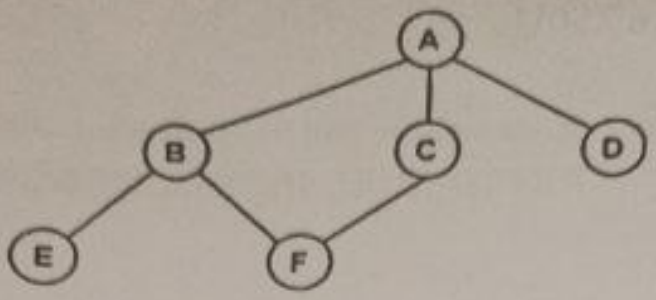
MODULE 2

3a. Explain the following terms with an example.
- i) state
- ii) state space
- iii) search tree
- iv) search node
- v) goal
- vi) action
- vii) transition model
- viii) branching factor

[2] [2] [1] [10]

3b. Compare Depth First Search and Breadth First Search Algorithm. Apply Breadth First Search algorithm for the below graph and Write the contents of open and closed list.

Start node: A
Goal node: F

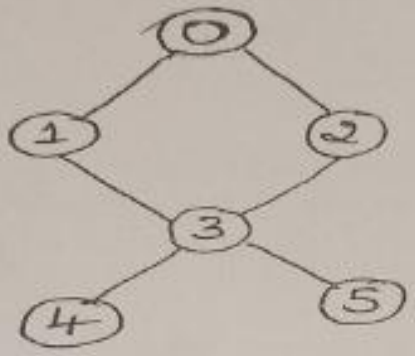


[3] [2] [2] [10]

OR

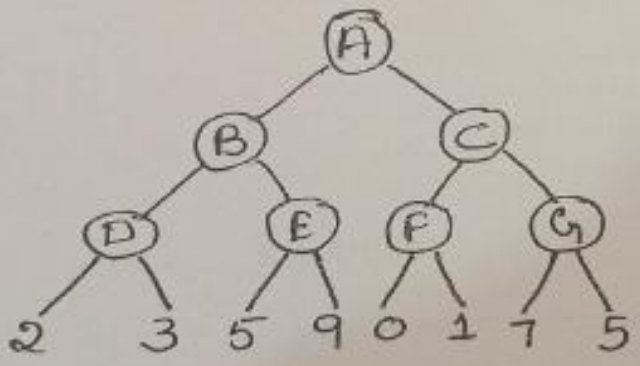
4a. Compare Uninformed search with Informed search. Apply Depth First Search algorithm for the below graph.

Start node: 0
Goal node: 4



[3] [2] [2] [10]

4b. Consider the following Game tree. Apply Alpha Beta algorithm (MAX moves first), write the final value of root node. Cross out the branches that do not need to be examined by alpha beta search.



[3] [2] [1, 2] [10]

MODULE 3

5a. Prove that the following prepositions are logically equivalent.

i) $p \rightarrow q$ and $\sim p \vee q$

ii) $p \leftrightarrow q$ and $(p \wedge q) \vee (\sim p \wedge \sim q)$

[3] [2] [2] [10]

5b. Determine the nature of the following propositions.

i) $p \wedge \sim p$

ii) $(p \wedge (p \rightarrow q)) \rightarrow \sim q$

[3] [2] [1, 2] [5]

5c. Translate the following English sentences to First Order Logic using predicates: Owns (x, y), Dog(x), Cat(x), Cute(x), and Scary(x).

i) John has a cute dog.

ii) All of John's dogs are cute.

iii) Unless John owns a dog, he is scary.

iv) Either John has at least one cat and at least one dog or he is scary (but not both at the same time).

[2] [2] [2] [5]

OR

6a. Differentiate between

i) Inference and Entailment

ii) Soundness and completeness

[2] [2] [1] [10]

6b. Explain Modus Ponens, And-Elimination Inference rules with suitable example.

[2] [2] [1] [5]

6c. Use the truth table method to determine whether

i) $(p \rightarrow q) \vee (p \rightarrow \sim q)$ is valid.

ii) $(\square\, p \vee q) \wedge (q \rightarrow \sim r \wedge \sim p) \wedge (p \vee r)$ is satisfiable.

[2] [2] [2] [5]

MODULE 4

7a. Explain PDDL? Write a PDDL description of the simple spare tire problem.

[2] [3] [1] [10]

7b. Explain Heuristics for Planning in detail.

[2] [3] [1] [10]

OR

8a. Describe the differences and similarities between problem solving and planning.

[2] [3] [1] [10]

8b. Explain

i) Forward (progression) state-space search.

ii) backward (regression) relevant-states search.

[2] [3] [1] [10]

MODULE 5

9a. Define Ontological engineering. List the two major characteristics of general purpose ontologies.

[2] [4] [1] [10]

9b. Write a short note on Categories and Objects with examples.

[2] [4] [1] [10]

OR

10a. Write the Baye's Rule. Apply the same rule to calculate the probability for given problem. It is estimated that 50% of emails are spam emails. Some software has been applied to filter these spam emails before they reach your inbox. A certain brand of software claims that it can detect 99% of spam emails, and the probability for a false positive (anon-spam email detected as spam) is 5%. Now if an email is detected as spam, then what is the probability that it is in fact a non-spam email?

[3] [4] [1, 2] [10]

10b. Define Uncertainty. Write the rules using propositional logic for diagnosing a dental patient's toothache.

[3] [4] [2] [10]