ARTIFICIAL INTELLIGENCE AND APPLICATIONS
(MCAP 2203)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Among the given options, which search algorithm requires less memory?
(a) Optimal Search (b) Depth First Search
(c) Breadth-First Search (d) Linear Search.

(ii) Which of the given language is not commonly used for AI?
(a) LISP (b) PROLOG
(c) Python (d) Perl.

(iii) Problem generator is present in Which of the following agent?
(a) Reflex (b) Observing
(c) Learning (d)None of these.

(iv) The performance of an agent can be better by which of the following?
(a) Learning (b) Observing
(c) Perceiving (d) None of these.

(v) In 8-Puzzle problem without heuristic the time complexity is
(a) $O(3^{20})$ (b) $O(10^{13})$
(c) $O(10^{24})$ (d) $O(13^{10})$

(vi) A* algorithm is based on
(a) Breadth-First-Search (b) Depth-First –Search
(c) Best-First-Search (d) Hill climbing

(vii) If 3m,3c|0m,0c|0m,0c represents the initial state of Missionaries and Cannibals problem, the valid next state will be
(a) 3m,1c|0m,2c|0m,0c (b) 1m,2c|2m,0c|0m,0c
(c) 2m,2c|1m,1c|0m,0c (d) 2m,2c|0m,0c|1m,1c

(viii) Which of the following system can perform Turing test?
(a) Eliza (b) MYCIN (c) Lisp (d) Honda Asimo

(ix) Which rule is equal to resolution rule of first-order clauses?
(a) Inference rule (b) Propositional resolution rule
(c) Resolution rule (d) None of the mentioned

(x) Which of the following is tautology?
(a) $p \vee q \rightarrow p$ (b) $p \wedge q \rightarrow p$
(c) $p \rightarrow q$ (d) None of these

Group – B

2. (a) What is 'State Space Search'? Explain the term heuristic based on (i) Euclidian Distance (ii) Manhattan Distance(iii) Number of misplaced tiles with example.

(b) Briefly explain the A^* algorithm as an Informed search technique with an example. Discuss the time complexity of Breadth-first search.

(3 + 3) + (4 + 2) = 12

3. (a) What is Goal Based Agent? Explain the basic features of Goal Based agent with diagram.

(b) Briefly explain any three the terms –(i) Agent (ii) Sensors (iii) Activators (iv) Effectors.

(2 + 4) + (2 + 2 + 2) = 12

Group – C

4. (a) How Alpha-Beta pruning modifies adversarial search? Explain with suitable example.

(b) Draw the State-Space-Graph of Wolf-Goat-Cabbage problem explaining the state representation in clear terms.

6 + 6 = 12

5. (a) Consider the following two statements:
S1:If a candidate is known to be corrupt, then he will not be elected.
S2:If a candidate is kind, then he will be elected.
-Which of the following statements follows from S1 and S2 as per sound inference rules of logic?-Explain.

- If a person known to be corrupt, he is kind.
- If a person is not known to be corrupt, he is not kind.
- If a person is kind, he is not known to be corrupt.
- If a person is not kind, he is not known to be corrupt.

A binary operation □is defined as follows :

P	Q	P □ Q
T	T	T
T	F	T
F	T	F
F	F	T

Which of the following is equivalent to PvQ.(Explain properly)

(i) ~P □~Q

(ii) P □~Q.

(iii) ~P □ Q.

(iv) ~Q □~P.

(b) Consider the following set of premises.

"If it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on".

"If the sailing race is held, then the trophy will be awarded".

"The trophy was not awarded"

From the above set of premises conclude that ~" It rained".

(4 + 4) + 4 = 12

Group – D

6. (a) Prove that- "Implication is good for ∀ quantifier. It is not a good interpretation for ∃ quantifier".

(b) Explain the Unification rule in FOL.

The following statements are given:

(i) The cat likes fish.

(ii) Cat eats everything they like.

(iii) Nany is a Cat.

Prove by Resolution that " Nany eats fish".

4 + (4 + 4) = 12

7. (a) Briefly explain the terms forward chaining and backward chaining in Rule based system with example.

(b) The following statements are given:

(i) Ravi likes all kind of food.

(ii) Apple and chicken are food.

(iii) Everything anyone eats and not killed is food.

(iv) Ajay eats peanuts and still alive.

(v) Rita eats that Ajay eats.

Prove by Resolution that :" Ravi likes peanuts".

(3 + 3) + 6 = 12

Group – E

8. (a) Write down the suitable predicates from a specific 'Blocks World' position.

(b) Write a prolog code to find out the factorial of a number.

(c) Explain the failure of goal stack planning with an emphasis on 'Sussman Anomaly'. Use suitable diagram.

4 + 3 + 5 = 12

9. (a) How does a 'Bayesian Network' work? Explain with an emphasis on conditional probability with suitable example.

   (b) When one has a cold, one usually has a high temperature (80% of the time). At any one time around 1 of every 10,000 people has a cold and that 1 in every 1,000 people has a high temperature. Now suppose you have a high temperature. What is the likelihood that you have a Cold?

8 + 4 = 12

Department & Section	Submission Link
MCA	https://classroom.google.com/c/MzA5NzA0OTEyMzg3/a/MjI2NDA0OTM5OTY1/details