INTELLIGENT SYSTEMS
(MCAP 2204)

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) Which is used to construct the complex sentences?
(a) Symbols (b) Connectives
(c) Logical connectives (d) All of these

(ii) The best case time complexity of depth first search is
(a) $O(b^d)$ (b) O(b)
(c) O(1) (d) None of these

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

(iv) Which instruments are used for perceiving and acting upon the environment?
(a) Sensors and Actuators (b) Sensors
(c) Perceiver (d) None of these

(v) The forward reasoning problems are generally represented by
(a) OR graph (b) AND graph
(c) AND-OR graph (d) None of these

(vi) According to modus tollens inference rule, from $p \rightarrow q$ and $\sim q$ infer
(a) p (b) q
(c) $\sim p$ (d) $\sim q$

(vii) Which is created by using single propositional symbol?
(a) Complex sentences (b) Atomic sentences
(c) Composition sentences (d) None of the mentioned

(viii) Which is not a pure AI game?
(a) Ludo (b) Tic-Tac-Toe
(c) Snakes and Ladders (d) Chess

(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 problems can be modelled as CSP?
(a) 8-Puzzle problem (b) 8-Queen problem
(c) Map coloring problem (d) All of these

Group – B

2. (a) What is goal based agent? Explain with suitable diagram.

(b) Consider the following system as an intelligent agent. Explain the following terms in connection to its sensing and actuation behavior.
(i) Percepts, (ii) Operating environment, (iii) Agent actions.
Given system: Mining robot.

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

3. (a) What are the areas that AI researchers have not yet got considerable success? Discuss.

(b) What are the drawbacks of DFS? How depth limited search overcomes these problems? How iterative deepening modifies DFS?

4 + (2 + 3 + 3) = 12

Group – C

4. (a) Justify the statement:
"A game is basically an AND/OR graph."

(b) What is forward checking in constraint satisfaction problem (CSP)? Discuss it with help of 4 Queens problem.

4 + (3 + 5) = 12

5. (a) Show that the following pair of propositions are logically equivalent.
$\neg p \wedge \neg q \rightarrow \neg r,\ r \rightarrow q \vee p$

(b) Show that the proposition $(\neg p \rightarrow q) \rightarrow (p \rightarrow \neg q)$is not a tautology.

(c) Verify the following theorem by Wang's algorithm.
$p \vee q, p \rightarrow r, q \rightarrow r \Rightarrow r.$

3 + 3 + 6 = 12

Group – D

6. (a) Give predicate logic statements to describe the following:
(i) The boy is either mad or a fool.
(ii) Computers can never be intelligent.
(iii) Everybody likes somebody but nobody likes everybody.

(b) Consider the following knowledge base:
(i) Every student likes those teachers, who are hardworking.
(ii) John is a student.
(iii) Marry is a teacher.
(iv) John does not like Mary.
(v) (Conclusion) Mary is not hardworking.
Prove by resolution theorem that the **conclusion** is derivable from the knowledge base.

6 + 6 = 12

7. (a) Represent the following statement using semantic network.
(i) The dog bit the mail carrier
(ii) Every dog has bitten a mail carrier.
(iii) Every dog in town has bitten the constable.

(b) With the help of an example discuss how inheritance is achieved in Semantic networks? "Frames are regarded as an extension to semantic nets." Justify the statement.

6 + (3 + 3) = 12

Group – E

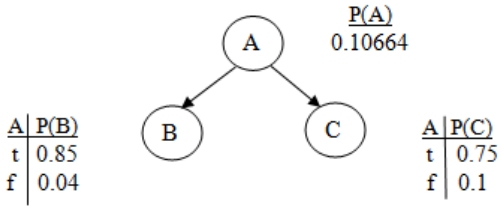
8. (a) Using your own intuition and definitions of the universe of discourse, plot fuzzy membership functions for the linguistic variable 'temperature' (use at least one trapezoidal and one triangular region).

(b) Show that the dilation of the Fuzzy set $\tilde{A}$ = CON($\tilde{B}$) is the fuzzy set $\tilde{B}$.

7 + 5 = 12

9. (a) Explain how to draw inference using Bayesian Network.

(b) Consider the following Bayesian Network containing 3 Boolean random variables:



Compute the following quantities:
P(¬B,C|A), (ii) P(A|¬B,C)

6 + 6 = 12

Department & Section	Submission Link
MCA	https://classroom.google.com/c/MzcxNzUxOTE1ODkx/a/Mzc0MzcwMjg3MTE4/details