No. of Printed Pages : 5

MCSE-003

MCA (Revised)

Term-End Examination

03056

June, 2016

MCSE-003 : ARTIFICIAL INTELLIGENCE AND KNOWLEDGE MANAGEMENT

Time : 3 hours *Maximum Marks : 100*

Note : *Question number **1** is **compulsory**. Attempt any **three** questions from the rest.*

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1. (a) Use Resolution to determine the validity of the following : 5

$$(\forall x)(\exists y)(A(x) \land B(y) \rightarrow$$
$$(A(y) \land B(x) \rightarrow (A(x) \rightarrow B(x))$$

(b) Transform the $P \lor (\neg P \land Q \land R)$ in Conjunctive Normal Form. 5

(c) Write a LISP program to find the maximum of 3 numbers. 5

(d) Discuss the concept of consistency and completeness testing of Expert system. 5

(e) Explain the rules of inference of propositional logic, noted as follows : 5

(i) Modus Ponens

(ii) Chain Rule

(f) Define the following in PROLOG : 4

(i) Parent (x, y)

(ii) Grandparent

(iii) Sibling

(iv) Both Parents of Sibling

(g) Write short notes on the following : 6

(i) Lambda function

(ii) Mapping function

(h) Compare the following pairs of terms : 5

(i) Hill climbing and BFS

(ii) Conceptual graph and Conceptual dependency

2. (a) It is required to recognize the English alphabetical characters F, E, X, Y, I and T in an image processing system. Define two fuzzy sets I and F to represent the identification of the characters I and F as follows :

$$I = \{ (F, 0{\cdot}4), (E, 0{\cdot}3), (X, 0{\cdot}1), (Y, 0{\cdot}1), (I, 0{\cdot}9), (T, 0{\cdot}8) \}$$

$$F = \{ (F, 0{\cdot}99), (E, 0{\cdot}8), (X, 0{\cdot}1), (Y, 0{\cdot}2), (I, 0{\cdot}5), (T, 0{\cdot}5) \}$$

Determine the following : 8

(i) $I \cup F$

(ii) $I \cap F$

(iii) $I - F$

(iv) $F \cup F^c$

(b) Elaborate the following in brief : *10*

(i) Knowledge

(ii) Intelligence

(iii) Inheritance Knowledge

(iv) Knowledge Acquisition

(v) Knowledge Management

(c) What is Means-Ends analysis ? Illustrate with an example. *2*

3. (a) Consider the following sentences :

- John likes all kinds of food.
- Apples are food.
- Chicken is food.
- Anything anyone eats and isn't killed by it, is food.
- Sue eats everything Bill eats.

(i) Translate the sentences into formulae in predicate logic.

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

(iii) Convert the formulae of part (i) into clause form.

(iv) Prove that John likes peanuts using resolution.

(v) Use resolution to answer the question, "What food does Sue eat ?" *10*

(b) Transform the following into DNF : 5

$$P \rightarrow ((Q \wedge R) \longleftrightarrow S)$$

(c) Represent the following statement in PROLOG : 5

Mohan eats banana.

4. (a) Express the following statements in propositional logic : 9

(i) Cancer will not be cured unless its cause is determined and a new drug for cancer is found.

(ii) If the humidity is high, it will rain either today or tomorrow.

(iii) It requires courage and skills to climb a mountain.

(b) Obtain a statement form for the formulae : 6

(i) $(\exists x)\,(Ay)\,(Az)\,(\exists u)\,(\forall v)\,(\exists w)\ P\,(x, y, z, u, v, w)$

(ii) $(\forall x)\,(\exists y)\,(\exists z)\,((\sim P\,(x, y) \wedge Q\,(x, z)) \vee R\,(x, y, z))$

(c) Explain the concept of planning with state space search using suitable examples. 5

5. (a) Draw the Semantic Net for the following : *8*

All penguins are birds.

All birds are animals.

All mammals are animals.

All cats are mammals.

Charley is a manx.

All manxes are cats.

All rexes are cats.

(b) What do you mean by learning ? Explain with an example. *2*

(c) A problem-solving search can proceed either forward (from a known state to desired goal state) or backward (from a goal state to start state). What factors determine the choices of direction for a particular problem ? *5*

(d) Prove that

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

is a tautology, without using truth table. *5*
