| MCSE-003 |

MCA (Revised)

Term-End Examination

December, 2015

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.*

1. (a) Transform the following into prenex normal forms : 5

    (i) $(\exists x) (\sim (\exists y) Q (x, y) \to ((\exists z) R(z) \to S(x)))$

    (ii) $(\forall x) (Q(x) \to (\exists x) R(x, y))$

    (b) Write FOPL to represent the following statements, and prove whether the conclusion follows from the premises or not : 5

    (i)   All dancers love to dance.

    (ii) Everyone who sings and plays an instrument loves to dance.

    (iii) Therefore, all dancers sing and play an instrument.

    (c) Derive DNF for the expression given as follows : 5

    $$\neg (P \lor \neg Q) \land (R \to S)$$

(d)   What do you mean by Non-monotonic reasoning system ? What are the constituent components of such systems ? Describe the interrelation between the components of such systems.   *5*

(e)   Use Resolution to determine the validity of the following :   *5*

$(((\forall x)\,(A(x) \to B(x))) \land (\neg\, B(x))) \to \neg\, A(x)$

(f)   Write a LISP program to convert the temperature in Fahrenheit to that in Centigrade.   *5*

(g)   Draw a truth table for the following expression :   *5*

$$\neg\, A \land (A \lor B) \land (B \lor C)$$

(h)   Write a well formed formula (wff) for the following :   *5*

(i)   God loves everyone who loves someone.

(ii)   Every person has a mother.

2. (a)   Differentiate between forward and backward chaining. What factors affect the decision to choose forward or backward chaining ?   *7*

(b)   What is a Turing Test ? Do you know about any machine which passed the Turing Test ?   *7*

(c)   Write the importance of Expert System.   *3*

(d)   Define a fuzzy function "Tall-man".   *3*

3. (a) Transform the following into the conjunctive normal forms : 5

$$(\neg P \wedge Q) \vee (P \wedge \neg Q) \wedge S$$

(b) What do you mean by local maxima with respect to search technique ? Explain with an example. 7

(c) What do you mean by Agent in Artificial Intelligence ? Discuss the properties and role of Agents in artificial intelligence. 8

4. (a) Evaluate the following LISP expressions : 5
   (i)   '(+ 9 3)
   (ii) (expt 2 5)
   (iii) (evenp (+ 9 6))
   (iv) (or '(at n_1) ())
   (v)   (equal '(two one) '(one two))

(b) Represent the following statement in PROLOG : 5

   Rita reads a book.

(c) Explain 'script' knowledge representation technique and write a script for a supermarket. 10

5. (a) List the limitations of using propositional logic to represent the knowledge base. *5*

(b) Draw a Semantic Net of the following : *7*

John and Mary loved each other and decided to get married. A month before the wedding, John discovered that Mary's father was secretly smuggling stolen art through Venice. After struggling with his conscience for days, John reported Mary's father to the Police. Mary understood John's decision, but she despised him for it nonetheless, and she broke off their engagement knowing he would suffer.

(c) Prove the following conjunctures using fuzzy DeMorgan law : *8*

(i) $A \cap B = (A^c \cup B^c)^c$

(ii) $A \cup B = (A^c \cap B^c)^c$