

**MCA (Revised)**  
**Term-End Examination**  
**December, 2014**

**MCSE-003 : ARTIFICIAL INTELLIGENCE AND  
 KNOWLEDGE MANAGEMENT**

*Time : 3 hours*

*Maximum Marks : 100*

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

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1. (a) In context of the objections to the Turing Test, briefly discuss the Chinese Room Test. 5
- (b) If the propositions are described as follows : 5
- P : He needs a doctor      S : He is Sick  
 Q : He needs a lawyer     U : He is injured  
 R : He has an accident
- Then represent the following formulas in English :
- (i)  $(P \wedge Q) \rightarrow R$
- (ii)  $(P \wedge Q) \leftrightarrow (S \wedge U)$
- (c) Describe 'Means-End Analysis' as a problem solving technique. 5
- (d) Write a recursive program in LISP to find factorial of a number given by the user. 5

- (e) Determine *Concentration* and *Normalization* of a Fuzzy set A 5  
 where, A = {Mohan|0.5, Sohan|0.9, John|0.7, Abdul|0, Abraham|0.2}
- (f) Obtain CNF for the following formula : 5  
 $\sim (A \rightarrow (\sim B \wedge C))$ .
- (g) Write Well Formed Formula (WFF) for the following statements : 5  
 (i) Every person has a father.  
 (ii) There is a man and he is the father of Ram.
- (h) Draw a Semantic Network for "ALBERT STRUCK LUCY IN THE GARDEN WITH A SHARP KNIFE, LAST MONTH". 5
2. (a) For each of the following closed formulas, prove the following (without using Truth tables) : 4  
 (i)  $(\forall x) P(x) \wedge (\exists y) \sim P(y)$  is inconsistent.  
 (ii)  $(\forall x) P(x) \rightarrow (\exists y) (P(y))$  is valid.
- (b) Transform the following formulas into Prenex Normal Form : 8  
 (i)  $(\forall x) (Q(x) \rightarrow (\exists x) R(x, y))$   
 (ii)  $(\exists x) (\sim(\exists y) Q(x, y) \rightarrow ((\exists z) R(z) \rightarrow S(x)))$
- (c) Name the form, to which the FOPL is finally transformed, such that it can be used for solving a problem with the Resolution method. Write the steps to bring FOPL to the form that can be used for resolution. 8

3. (a) Symbolize and construct a proof for the following valid arguments, using rules of inference : 8
- (i) If you smoke or drink too much, then you do not sleep well, and if you do not sleep well or do not eat well, then you feel down.
- (ii) If you feel down, you do not exercise well and do not study enough.
- (b) Explain the sequence of steps of evaluation of the following LISP expression :  
(length (append (setq x '(ab)) '(cd) (reverse (sublist x '(st) '(uvx))))) 6
- (c) Write a Prolog Program that adds an element X to a given set L. 6
4. (a) What are S-Expressions in LISP ? Draw tree structure to classify the various categories of S-Expressions. Evaluate the following S-Expressions : 7
- (i) (+ (setq x 7) (setq y 3))
- (ii) (+ (\* 2 3 4) (- 89) (truncate (15 7)))
- (b) What are Expert Systems ? Briefly discuss the various categories of software tools, used for the development of expert systems. 6
- (c) What are Rational Agents ? What are the various factors on which the rationality of an agent depends ? 7

5. Compare and contrast any *four* pairs from the following :  $4 \times 5 = 20$

- (i) Associative Networks and Conceptual Graphs
  - (ii) Predicate Logic and Propositional Logic
  - (iii) Frames and Scripts
  - (iv) Abductive Inference and Analogical Inference
  - (v) Resolution and Unification
  - (vi) MYCIN and EMYCIN
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