

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: BE  
BRANCH: IT

SEMESTER : VII  
SESSION : MO/19

SUBJECT: IT7025 ARTIFICIAL INTELLIGENCE

TIME: 3:00 HOURS

FULL MARKS: 60

**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
  2. Candidates may attempt any 5 questions maximum of 60 marks.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) What is the difference between Natural Intelligence and Artificial Intelligence? What are the applications of AI? [2]
- Q.1(b) Describe the following terms (any two):  
a) Belief and Hypotheses b) Heuristic knowledge c) Epistemology and Metaknowledge d) Turing test.
- Q.1(c) (I) What is the use of inference engine? Discuss the importance of knowledge base system. [2x2=4]  
(II) Briefly describe the meaning of knowledge representation and knowledge acquisition.
- Q.2(a) Define a function in LISP called first-element that takes a list as its argument and returns the first top element of the list. [2]
- Q.2(b) (I) Explain with example-what is 'lambda function'. Why is this function so important in LISP? [1+3=4]  
(II) Write LISP code to find Palindrome using Recursion.
- Q.2(c) (I) Implement a PROLOG predicate remove\_duplicates that removes all duplicate elements from a list given in the first argument and returns the result in the second argument position. [3+3=6]  
Example:  
?- remove\_duplicates([a, b, a, c, d, d], List).  
List = [b, a, c, d]
- (II) Write a PROLOG code for predicate longer that takes two lists as arguments and succeeds if the second is longer (has more elements) than the first.  
Examples:  
?- longer([dog, cat, snake], [giraffe, elephant, lion, tiger]).  
Yes  
?- longer([1,2,3,4,5], []).  
No
- Q.3(a) (I) What are the differences between Propositional Logic and Predicate Logic. [1+2=3]  
(II) What are the limitations of Predicate logic as a tool for Knowledge representation? Illustrate through examples.
- Q.3(b) (I) Write an unification Algorithm and explain it with proper examples. [2+3=5]  
(II) Explain different approaches to knowledge representation.
- Q.3(c) Consider the following axioms: [4]
1. Every child loves Santa.
  2. Everyone who loves Santa loves any reindeer.
  3. Rudolph is a reindeer, and Rudolph has a red nose.
  4. Anything which has a red nose is weird or is a clown.
  5. No reindeer is a clown.
  6. Scrooge does not love anything which is weird.
  7. (Conclusion) Scrooge is not a child.
- i) Translate these sentences into formulas in predicate logic ii) Convert the formulas of part into a clausal form iii) Prove the conclusion using resolution.
- Q.4(a) Transform the following conceptual graphs into equivalent FOPL statement: [2]  
[CAMEL: clyde] <- (AGENT) <- [DRINK] -> (OBJECT) - [WATER] -> (ATTRIBUTE) -> [50-GALLONS]

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- Q.4(b) Translate the following sentences into Conceptual Dependencies: [2x2=4]  
 a) Vishwanath gives Vidushi a book.  
 b) Charlie drove the pickup fast.
- Q.4(c) (I) Present the following in two different Semantic Nets: [3+3=6]

1. Dave is Welsh, Dave is a Lecturer.
2. Paul lent his new Frank Zappa CD to his best friend.

(II) Use the conceptual dependencies to define the script for: 'visiting a doctor' and explain.

- Q.5(a) Compare non-monotonic and statistical reasoning with examples. [2]  
 Q.5(b) What is 'Truth maintenance system (TMS)'? Consider the following statements: [4]

- (i) Most thing do not fly.
- (ii) Most bird do fly, unless they are too young or dead or have a broken wing.
- (iii) Penguins and ostriches do not fly.
- (iv) Magical ostriches fly.
- (v) Tweety is a bird.
- (vi) Chirpy is either a penguin or an ostrich.
- (vii) Feathers is a magical ostrich.

How TMS will give the answer of the following: 'Does feathers fly?' with the help of above lists.

- Q.5(c) Write the short notes on following topics: [6]  
 (I) Default reasoning and Close world assumption.  
 (II) Bayesian network and its application for reasoning.

- Q.6(a) (I) What is the relevance of search and control strategies in problem solving? [1+1=2]  
 (II) Sate the advantage of heuristic search.

- Q.6(b) (I) Compare and contrast Depth first search and Breadth First Search by illustrating the advantages and disadvantages of each. [2+2=4]

(II) Explain the 8-Puzzle problem along with its state space tree representation.  
 Example of 8-Puzzle problem:

7	4	2
1	5	
6	3	8

Initial State

1	2	3
8		4
7	6	5

Goal state

The 8-Puzzle involves moving the tiles on the board above into a configuration. The black square on the board represents a space. The player can move a tile into the space, freeing that position for another tile to be moved into and so on.

For example, given the initial state above we may want the tiles to be moved so that the following goal state may be attained.

- Q.6(c) (I) State the difference between simple hill climbing and steepest ascent hill climbing. What are the drawbacks of Hill climbing algorithm- explain? [2+4=6]  
 (II) What is best first search and how it is different from A\* search. Explain A\* search algorithm with an example.

- Q.7(a) Explain the following measures for matching (any two): [2x2=4]  
 a) Probabilistic Measures b) Qualitative measures c) Similarity measures.

- Q.7(b) Write down the procedures for matching two structure like: [2+2=4]  
 (a) Matching substrings and (b) Matching sets and bags.

- Q.7(c) Describe different knowledge indexing and retrieval techniques for knowledge organization and management. [4]