Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/MCA/SEM-3/MCA-303/2013-14

2013

INTELLIGENT SYSTEMS

Time Allotted : 3 Hours *Full Marks :* 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

   i) An algorithm that gives optimal solution is

   a) Hill climbing b) BFS

   c) Blind search d) A^*

   ii) Which one is blind search ?

   a) DFS b) A^* search

   c) Best first search d) AO^* search.

   iii) According to Modus Ponens rule P and $P \rightarrow Q$ infer

   a) P b) Q

   c) $\neg P$ d) $\neg Q$.

iv) Iterative deepening search procedure is

a) optimal with respect to time consumption

b) optimal with respect to space consumption

c) both (a) & (b)

d) none of these.

v) Which of the following is tautology ?

a) $(P \wedge Q) \wedge \neg Q$ b) $(P \wedge Q) \rightarrow P$

c) $P \wedge \neg Q$ d) None of these.

vi) Complexity of BFS in a tree having depth d and branching factor b is

a) $O\left(b^d\right)$ b) $O\left(d^b\right)$

c) $O(b + d)$ d) None of these.

vii) Which is *not* a pure AI game ?

a) Ludo b) Snakes and ladder

c) Tic-tac-toe d) Chess.

viii) Skolem function is used in

a) unification algorithm

b) natural deduction

c) conversion to clausal form

d) none of these.

ix) Frame is a collection of

a) slots b) filler

c) resolution d) knowledge.

x) $\exists y [\neg \forall x P(x) \rightarrow Q(y)]$ is equivalent to

a) $\exists y [\exists x P(x) \rightarrow Q(y)]$

b) $\forall y [\neg \exists x P(x) \vee Q(y)]$

c) $\exists y [\neg \exists x \neg P(x) \vee Q(y)]$

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. What are the different knowledge representation mechanisms ?

3. Give predicate logic statement to describe the following :

i) The boy is either mad or fool

ii) Computers can never be intelligent

iii) Children hate all those who hate animals.

4. Explain that Breadth First Search is a special case of Uniform Cost Search, which in turn, is a special case of Best First Search.

5. Prove the admissibility and completeness of A^*.

6. State the Modus Ponen rule with example. Differentiate between forward and backward rules with example.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) How do you evaluate the search strategies ?

   b) Compare the depth first search and breadth first search with respect to the advantages and disadvantages.

   c) Formulate Wolf-Cabbage-Goat-Farmer problem and explain the problem by using a state space.

$2 + (2 + 2) + (4 + 5)$

8. Suppose that you have this search space like that :

State	Next	Cost
A	B	4
A	C	1
B	D	3
B	E	8
C	C	0
C	D	2
C	F	6
D	C	2
D	E	4
E	G	2
F	G	8

a) Draw a state space from the given table. 3

b) Assume that initial state is *A* and goal state is *G*. Show how these search strategies would create a search tree to find a path from initial to goal state.

* Breadth first search
* Depth first search
* Uniform cost search
* A^* search

At each step of the search algorithm show which node algorithm is being expanded, and the content of fringe. Also report the eventual solution found by each algorithm and the solution cost. 3 + 3 + 3 + 3

9. a) The game of NIM is played like that : Two players alternate in removing one. Two or three coins from a stack initially containing five coins. The player who picks up the last coin loses.

i) Draw the full game tree.

ii) Show that the player who has the second move can always win. 7 + 3

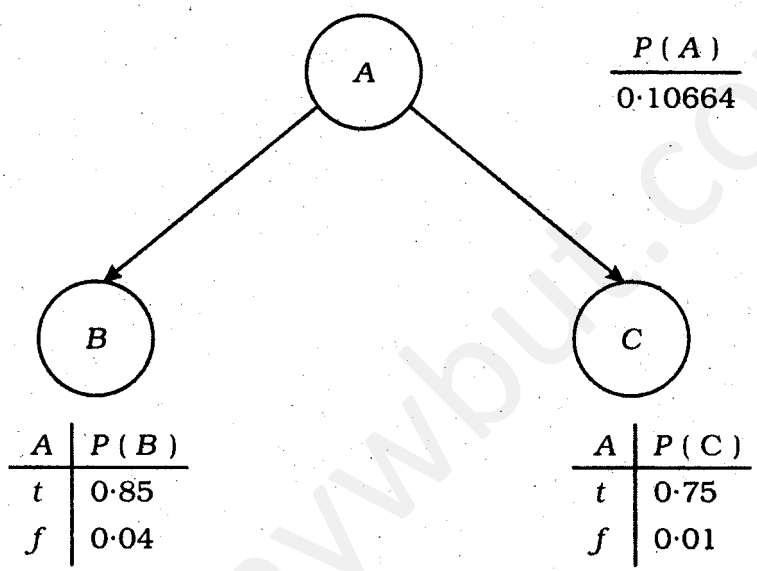
b) How does α-β pruning procedure improve search procedure ? 5

10. a) What is Bayes' theorem ? 2

b) Write a PROLOG or LISP program to search an element in a list. 4

c) What are different forms of learning ? Discuss the explanation-based learning. 2 + 3

d) Consider the Bayesian network with 3 Boolean random variables : 4



$P(A)$
0·10664

A	$P(B)$
t	0·85
f	0·04

A	$P(C)$
t	0·75
f	0·01

Compute the following quantities :

i) $P(\sim B, C \mid A)$

ii) $P(A \mid \sim B, C)$

11. Write short notes on any *three* of the following : 3 × 5

a) Semantic net

b) Hill climbing strategy

c) Agent

d) Different passing techniques in natural language processing

e) *N* queens' problem.