BITS PILANI, DUBAI CAMPUS
Dubai International Academic City, Dubai
Second Semester 2012-13
Comprehensive Exam

No. of Questions: 6
No. of Pages : 3

Course Number& Title : EA C461 – Artificial Intelligence   Marks : 80   Weightage : 40%

Duration : 3 Hours   Date: 14-6-2012   Time:12.30PM – 3.30PM   Year : IV year

Note : Answer All Questions

1. a. Given the map of Romania, show in which order the nodes are expanded given that the start node is Oradea and the destination node is Bucharest, in each of the following techniques.
   i)   Breadth First Search
   ii)   Depth First Search
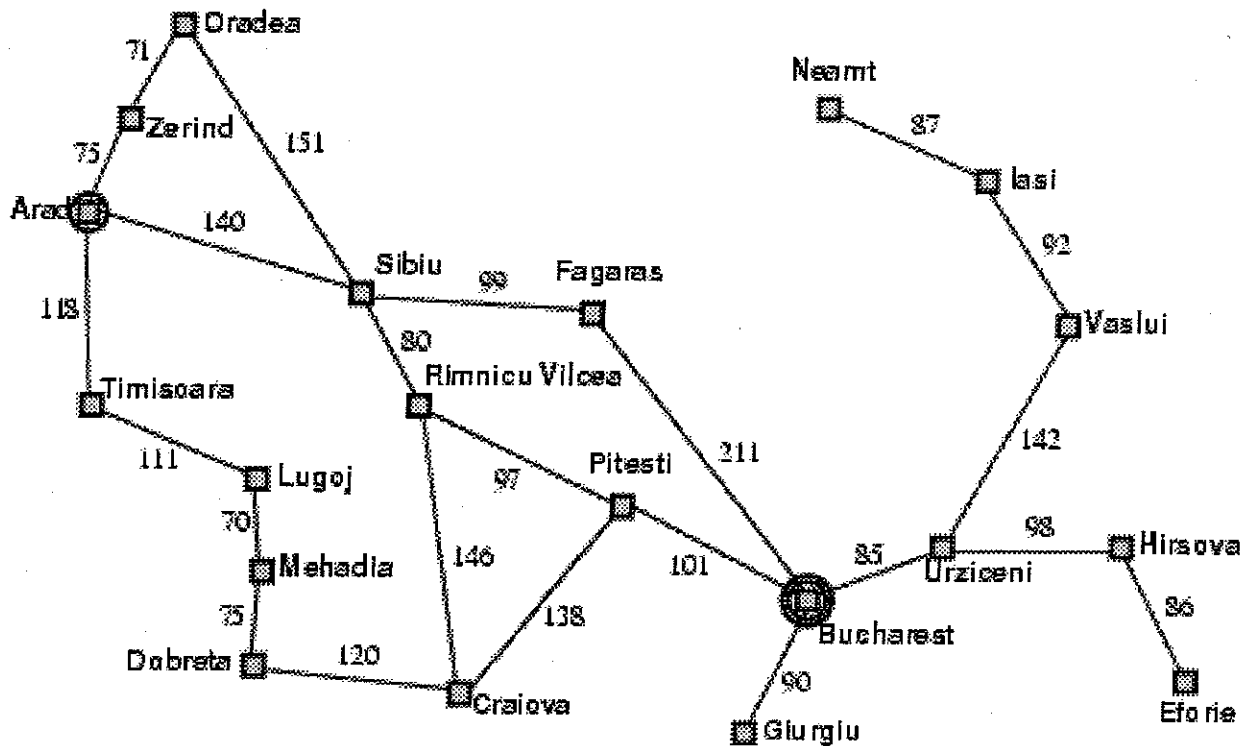   **iii)**   Best First search   3 X 3 = 9M

Fig. 1.1

ii) If the winner is married, what is the probability that it is a woman?   2 X 3 = 6 M

b. Assume the following scenario. You are witness of an accident at night time involving a taxi in Athens. In Athens all taxis are either green or blue. You swear under oath that the taxi that you saw was blue. Extensive testing shows that under the dim lighting conditions, discrimination between blue and green is reliable 75% of the time. What is the most likely color of the taxi given no other information? What is the probability that the taxi is blue if you would know in addition that 80% of the taxis in Athens are green and 20% of the taxis are blue.   6M

5. a. Represent each of the following prepositional logic statements in *clausal form* (i.e., conjunctive normal form, CNF).   (3 + 3 + 4M)

i). $(P \rightarrow Q) \wedge (R \vee S)$

ii) $(P \wedge Q \rightarrow (X \vee Y)) \vee (R \wedge S)$

iii) $((P \rightarrow Q) \rightarrow \neg X) \leftrightarrow (A \wedge B)$

b. Write the following sentences in First Order Predicate Logic:

   i)   Every student uses some computer and at least one computer is used by every student.
   ii) Every year, some male students fail every exam, but every female student passes some exam.
   iii) Every man loves some woman who loves another man .
   iv) No two philosophers have the same favorite book   4 X 3 = 12 M

6. Explain the following terms.
i) Use of clustering algorithms in the Bayes network with an example.
ii)Learning using Decision trees with an example.
iii) What is the difference between pattern recognition/classification and function approximation/regression? Describe a concrete example of each learning task.   (3+3+4M)

*******************ALL THE BEST FOR THE EXAM AND YOUR FUTURE *********************

BITS PILANI, DUBAI CAMPUS
Dubai International Academic City, Dubai
First Semester 2012-13
Test – 2(Open Book)

No. of Questions: 3

No. of Pages   : 1

Course Number& Title : EA C461 – Artificial Intelligence   Marks : 20   Weightage : 20%

Duration : 50 minutes   Date: 24-4-2012   Time:8.25 AM – 9.15AM   Year : IV year

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Note : Answer All Questions

1.For Christmas, Scrooge decides to get his Tiny Tim a pair of slippers or a pair of gloves. M&S stock both: slippers at £19.99 and gloves at £12.99.

a. We wish to show that Scrooge can buy the gift at M&S.
   i) Express this problem in Predicate Logic.
   ii) Use resolution to show that Scrooge can buy the gift at M&S. 7M

2.a. An urn contains 6 red marbles and 4 black marbles. Two marbles are drawn *without replacement* from the urn. What is the probability that both of the marbles are black? 3M

b.M&M's and Smarties are two different brands of small milk chocolates in a crisp coloured shell. Each item of confectionery is about the same size and each brand comes in a mixture of colours. A large bowl contains a mixture of the two brands in the ratio of five M&M's to four Smarties in just four colours - red, yellow, orange and green. The proportions of the M&M's which are red, yellow, orange and green are 0.3, 0.4, 0.1 and 0.2 respectively, while the equivalent proportions for Smarties are 0.25, 0.2, 0.3 and 0.25. A sweet is chosen at random from the bowl. What is the probability that it is (i) a green Smartie; (ii) green; (iii) a Smartie if it is green? 6M

3.Represent the following sentence using predicate logic. Yesterday John went to Zico supermarket and bought nuggets and mayonnaise with which he made a hot dog.   4M

*********************************** ALL THE BEST*****************************

BITS PILANI, DUBAI CAMPUS
Dubai International Academic City, Dubai
First Semester 2012-13
<u>Test – 1(Closed Book)</u>

| No. of Questions: 2 |
| No. of Pages   : 2 |

Course Number& Title : EA C461 – Artificial Intelligence   Marks : 25   Weightage : 25%

Duration : 50 minutes   Date: 6- 3-2012   Time:8.25 AM – 9.15AM   Year : IV year

Note : Answer All Questions

1.a. Explain the difference between uninformed and informed search. List two examples of each type of algorithm. [2 marks]

b. In the context of planning, describe what a heuristic is and what it means for it to be admissible. List two examples of typical heuristic functions. [2 marks]

c. Explain what A* search is, including the advantages and disadvantages with respect to its theoretical properties. [2 marks]

d. Draw a search tree for the 8-puzzle problem up to depth 3 (start state is depth 0) using the A* algorithm (omit repeated states) with the evaluation function $f(n) = p(n)+h(n)$, where $p(n)$ is the number of steps from the start state (start state is step 0) and $h(n)$ is the number of misplaced tiles. Note that the actions for sliding tiles should be used in this order: right, left, up and down. Write the values of f and of its components p and h under each state.[6 marks]

Start state

1	2	3
4	8	5
7	6	

Goal state

1	2	3
4	5	6
7	8	

(e) Give the **algorithm** for the Hill Climbing search technique. Discuss some of the issues observed in the Hill Climbing technique. [3 marks]

P.T.O

2.a. Give a detailed description of the minimax algorithm for two-player games, illustrating your answer using the following game tree. [3 marks]

8 9 3 4 5 7 1 3 8 2 4 3 9 2 2 9 1 5 6 4 2 3 7 3 8
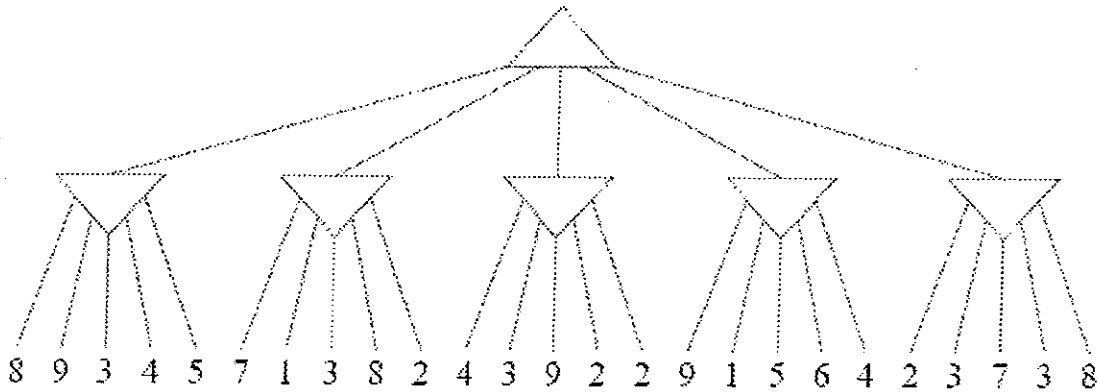
b. Discuss why in game playing, search always occurs from the current state to the goal state and not from the goal state to the current sate.   [2 marks]

c. Give a detailed description of the technique of α-β pruning, again illustrating your answer using the game tree above.   [5 marks]

Course Number & Title : EA C461 – Artificial Intelligence   Weightage : 8%

Duration : 20 minutes   Date: 26- 3-2012   Year : IV year   Marks : 8

Name: _____   ID: _____

1. A. Give the output of the following LISP expressions   0.5 X 4 = 2M

   i)   (* 2 (Cos 0) (+ 4 6))

   ii):(CDR (CAR '((CAR CDR) CAR)))

   iii)   (CAR '(ADD 1 2))

   iv)   :(CDR '(ADD 1 2))

2.Write a LISP function to generate the Fibonacci Series where the Fibonacci series is given as Fib(n) = 1 for n=0 or n=1 or Fib(n) = Fib(n-1) + Fib(n-2) for n>1.   2M

P. T. O

3.Convert the given expression to CNF form.   2M

$$\neg(g \wedge (r \rightarrow f))$$

4.

4. Obtain the truth table for $(p \wedge (\neg q)) \rightarrow p$ and state if it is valid or satisfiable or unsatisfiable.   1M

5. Use propositional resolution to show that the following set of clauses are unsatisfiable   1M

{p,q}, { ¬p, r}, { ¬p, ¬r}, {p, ¬q}