DHARMSINH DESAI UNIVERSITY, NADIAD
FACULTY OF TECHNOLOGY
B.TECH. SEMESTER VII CE
SUBJECT: (CE 701) ARTIFICIAL INTELLIGENCE

Examination : Regular   Seat No   : CE-84
Date   : 25/11/2019   Day   : Monday
Time   : 11·30 to 2-30pm   Max. Marks : 60

INSTRUCTIONS:
1. Answer each section in separate answer book.
2. Figures to the right indicate maximum marks for that question.
3. The symbols used carry their usual meanings.
4. Assume suitable data, if required & mention them clearly.
5. Draw neat sketches wherever necessary.

SECTION – I [10]

Q.1 Do as directed.
  (a) Give one example each of Red Cut and Green Cut. [2]
  (b) Why the use of the cut & fail controversial in PROLOG? [2]
  (c) Give an example of a sound inference rule. Prove that it is sound. [2]
  (d) Which Proof Technique/Principle does Resolution use? State it. [2]
  (e) Whether f(x) and f (g(y)) unify or not? Justify your answer. [2]

Q.2 Attempt Any TWO from the following questions. [10]
  (a) Write a PROLOG program for finding Union of any two lists.
      eg. Union([1,2], [3,4], Z) gives Z=[1,2,3,4] , 1 solution, as the answer. [5]
  (b) Give two different PROLOG versions for defining Reverse function- one with accumulating parameter and other without it. [5]
  (c) Give a PROLOG program for generating elements of Fibonacci Series. [5]

Q.3 (a) What are the advantages/limitations of Semantic Nets? Draw partitioned Semantic Net for the sentence "Every city has a dog-catcher who has been bitten by every dog in city". [5]

  (b) Explain "Convert to Clause Algorithm", used by Resolution. Discuss every step of the algorithm in the context of the sentence "All Romans who know Marcus either hate Caesar or think that anyone who hates anyone is crazy". [5]

OR

Q.3 (a) Consider the following sentences: [5]
      I. John likes all kinds of food.
      II. Apples are food.
      III. Chicken is food.
      IV. Anything anyone eats and is not killed by is food.
      V. Bill eats peanuts and is still alive.
      VI. Sue eats everything Bill eats.

      Prove that "John likes peanuts "using Backward chaining. Assume additional knowledge, only if necessary.

  (b) Discuss classification of Logic systems and Logical Reasoning kinds in detail. [5]

SECTION – II

Q.4 Do as directed. [10]
  (a) List the capabilities, which are required by machines to pass the Turing's test. Write the purpose of each capability listed. [2]
  (b) What are the reasons that favour usage of Heuristic in solving AI problems? [2]
  (c) Which are the requirements of good control strategy? [2]

(d) Consider two fuzzy subsets of the set X, X={a, b, c, d, e, f, g} referred to as A and B. [2]
A= {1/a ,0.3/b ,0.2/c ,0.8/d ,0/e, 0.1/f ,0.4/g } and B= {0.6/a, 0.9/b ,0.1/c,0.3/d ,0.2/e
,1/f ,0/g }
Find cardinality and α-cut at 0.2 for A and B.
(e) Generate soundex codes for following words. Substitutions for generating the soundex [2]
codes are listed in following table.
Words: Torn, Worn, Horn, Henry, Henary, Grate, Ashcraft

Letter(s)	Substitute with Integer
B,F,P,V	1
C,G,J,K,S,X,Z	2
D,T	3
L	4
M,N	5
R	6

Q.5 Attempt *Any TWO* from the following questions. **[10]**

(a) Let there be two versions of A*. A_1* and A_2*, employing two heuristic functions [5]
$h_1(G)$ and $h_2(G)$ respectively. Let us assume that both heuristic functions have found
the path up to P and Q with cost(g) 100 from *start* state. Let both heuristic functions
erroneously evaluate Q to be nearer to the goal G than P is. Let the actual cost of the
move from P to G be 40 and cost of the move from Q to G be 50. h_1'(P)=80,
h_1'(Q)=70, h_2'(P)=30 and h_2'(Q)=20. Assume only P and Q are in OPEN list in
some order. The path found to goal by A_1* has cost _____ and path found by A_2*
has cost _____. The reason that A_1* fails is _____ and the reason that A_2*
succeeds is _____. Show all steps with necessary explanation.

(b) Solve **POINT + ZERO = ENERGY** crypt-arithmetic problem based on given rules: [5]
Rules: Each letter or symbol represents only one digit throughout the problem. When
letters are replaced by their digits, the resultant arithmetical operation must be correct.
The numerical base is 10. Numbers must not begin with a zero.

(c) Solve 8-puzzle problem using steepest ascent hill climbing algorithm. To calculate [5]
desirability of a move use following heuristic function.
H(X): Sum of Manhattan distance of the tiles from their goal positions.
H(Start) = h(1)+h(2)+h(3)+h(4)+h(8)+h(7)+h(6)+h(5)=0+0+0+0+1+0+2+2=5
H(Goal)= 0

1	2	3
4	8	
7	6	5

Start

1	2	3
4	5	6
7	8	

Goal

Note: Tile's movement is restricted only to horizontal and/or vertical direction.

Q.6 (a) Using genetic algorithm maximize $f(x) = x^2$ over {0, 1, 2,..., 15} with initial x value [5]
of {1,6,8,10}. Show at least three iteration of Genetic algorithm.

(b) Design fuzzy control system using mamdani inference for following 'tipping' [5]
problem.
Inputs: food(rancid, moderate, delicious), service(poor, average, excellent)
Output: tip (less, medium, generous)
Rules:

- If the food is rancid OR the service is poor, then the tip will be less
- If the service is average, then the tip will be medium
- If the food is delicious AND the service is excellent, then the tip will be
generous

OR

Q.6 (a) Answer following questions referring to given corpus.

    I.   What is a parallel corpus? [1]

    II.   Give an example of collocation based on given corpus. [1]

    III. How many tokens are present in given corpus? [1]

    IV. Write the equation of computing probability of sentence "*swarm intelligence is* [2] *the collective behaviors of decentralized self organized systems natural or artificial*" using bigram model.

corpus:

swarm intelligence is the discipline that deals with natural and artificial systems composed of many individuals that coordinate using decentralized control and self organization in particular the swarm intelligence discipline focuses on the collective behaviors that result from the local interactions of the individuals with each other and with their environment examples of systems studied by swarm intelligence are colonies of ants and termites schools of fish flocks of birds herds of land animals some human artifacts also fall into the domain of swarm intelligence notably some multirobot systems and also certain computer programs that are written to tackle optimization and data analysis problems

(b) Apply the alpha-beta cutoff algorithm on the tree given in Fig (I). Show the branches [5] of the tree which are pruned away and also the value of alpha-beta at every node in the tree.
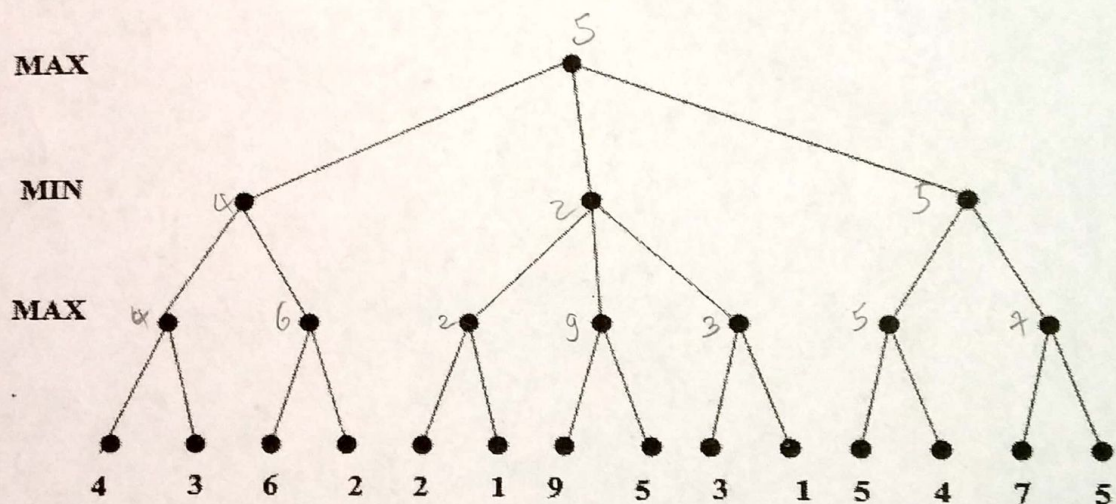

Fig (I)