



End Semester Examinations

A.Y.: Nov – Dec 2019

Max. Marks: 75

Class: BE

Course: Artificial Intelligence & Soft Computing

Program: Computer Engineering

Duration: 3hr.

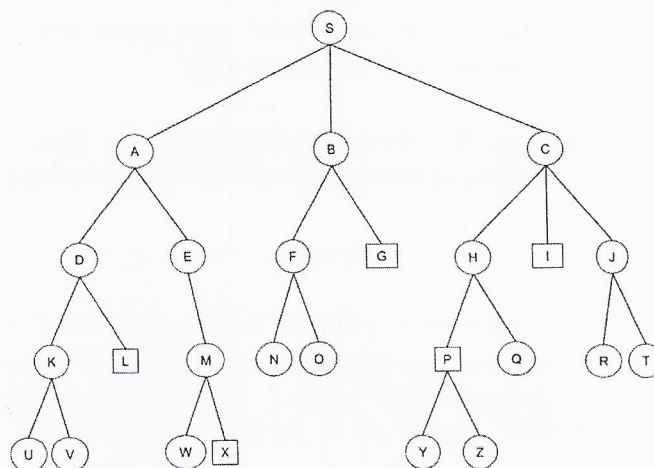
Semester: VII

Course Code: DCSC703

Instructions:

- (1) All Questions are Compulsory.
- (2) Assume suitable data wherever required, but justify it.
- (3) All questions carry equal marks.
- (4) Answer to each new question is to be started on a fresh page.
- (5) Figure to the right indicate full marks.

Question No.		Max. Marks
Q1(a)	Differentiate between Soft Computing and Hard Computing with Examples.	05
Q1(b)	Write PEAS (Performance, Environment, Actuator and Sensors) for the following <ol style="list-style-type: none"><li>(i) Part Picking Robot</li><li>(ii) Internet Shopping Agent</li></ol>	05
Q1 (c)	Mention the characteristics and properties of neuro –fuzzy hybrid systems.	05
Q2 (a)	i. Refer following graph and list the order in which the Depth First Iterative Deepening (DFID) algorithm explores the graph till termination, searching from left to right. Consider goal states in square boxes.	04





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- ii. Consider a start and goal state of a blocks world problem. Devise two heuristic  $h_1$  and  $h_2$ . Show which heuristic is better. 07

OR

- ii. Consider 5-bit representation for candidate 1: 13, candidate 2: 24, candidate 3: 8 and candidate 4: 19. If fitness function  $f(n)$  is represented as  $x^2$  calculate the probability and estimated values (if the rule wheel is spinned 4 times). Given that candidate 1 appears 1 time, candidate 2 appears 2 time and candidate 4 appears 1 time on rule wheel. Consider single point crossover and generate new candidates. Compare average fitness of both the population and discuss the impact of GA. 07

- Q2 (b) Discuss the behavior of  $A^*$  algorithm in case of underestimating and overestimating heuristic. 04

OR

- Q2 (b) Discuss Time complexity, space complexity, completeness and quality of Hill Climbing 04

- Q3 (a) Consider the following statements: 10
- Akash likes all kind of food.
  - Cake and Biryani are food.
  - Anything anyone eats and is not killed as food.
  - Vishnu eats mangoes and still alive.
  - Nishu eats everything that Vishnu eats.
- Convert the sentences in first order logic and prove that “Akash likes mangoes” using forward chaining and backward chaining.

OR

- Q3 (a) Define a family tree for three generation using First order logic and prove grandparent and grandchild relation using backward chaining. Assume suitable data. 10
- Q3 (b) Differentiate between Propositional logic and Predicate Logic (FOL). 05
- Q4 (a) Design a computer software to perform image processing to locate objects within a scene. The two fuzzy sets representing a car and a train image are: 03
- Car:  $\{(train, 0.2), (bike, 0.5), (boat, 0.3), (car, 0.8), (house, 1)\}$   
Train:  $\{(train, 1), (bike, 0.2), (boat, 0.4), (car, 0.5), (house, 0.2)\}$   
Find the following:
- a.)  $Car \cup Train$
  - b.)  $Car \cap Train$
  - c.)  $Car^c$



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- Q4 (b) Design a fuzzy controller using Takagi Sugeno Approach for a system which uses two inputs  $I_1$  having 3 descriptors (low, medium and high) and  $I_2$  having 3 descriptors (near, far, very far). Output  $Y_i$  is a function of  $I_1$  and  $I_2$  which can be written as  $a^i_j I_1 + b^i_k I_2$  where  $j$  and  $k$  are 1, 2, 3. Find the output for  $I_1=6$  and  $I_2=2.2$ . 12

OR

- Q4 (b) Design a Fuzzy controller to guide a robot. Assume there are 4 different objects present and the robot has to decide in which direction it has to move. Consider two input parameters  $D$  for distance of robot from the object,  $\Theta$  is the angle of motion of an object with respect to robot. The value of the parameter wrt the most critical object will decide an output called deviation ( $\delta$ ). Universe of discourse  $D=[0.1$  to  $2.2]$  in meters and  $\Theta = [-90$  to  $90]$  in degree. Find the angle  $\delta$  in which the robot should move if  $D$  is 1.04m and  $\Theta = 30^\circ$ . Use 4 descriptor for distance and 5 descriptors for angle. Make suitable assumptions where required. 12

Q5 Solve any three.

- i. Discuss the limitation of perceptron model. 05
- ii. State any two activation function used in neural network. 05
- iii. Implement AND function using Mc-Culloch Pitts Model. 05
- iv. Discuss the important features of kohonen self organizing maps. 05







**End Semester Examination (February 2022)**  
**Academic Year: 2021-2022**

**Max. Marks: 50**

Class: Third Year B.Tech.

Course: Artificial Intelligence

Program: Computer Engineering

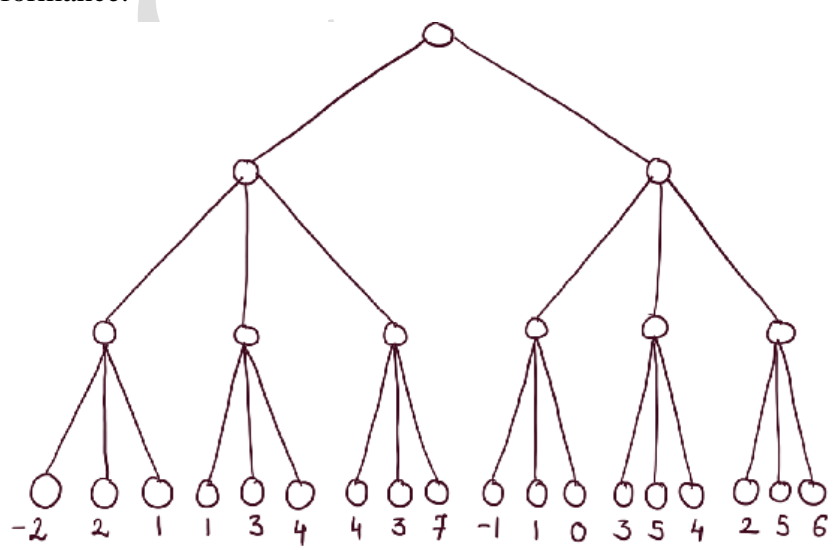
**Duration: 2 Hr.**

Semester: V

Course Code: DJ19CEC503

**Instructions:**

- (1) Solve ANY FIVE questions.
- (2) Read the questions carefully.
- (3) Assume suitable data wherever required, but justify it.
- (4) All questions carry equal marks.
- (5) Answer to each new question is to be started on a fresh page.
- (6) Figure to the right indicate full marks.
- (7) Draw the neat labelled diagrams wherever necessary.

Question No.		Max. Marks
Q1 a	Draw and describe architecture of Utility based agents. How it is different from Model based agent?	6
Q1 b	Discuss different phases of Genetic Algorithm.	4
Q2	<p>Apply Alpha Beta pruning algorithm to following example and analyse it's performance.</p> 	10



Q3 (a)	Consider Following facts, 1. If maid stole the jewellery then butler was not guilty. 2. Either maid stole the jewellery or she milked the cow. 3. If maid milked the cow then butler got the cream. 4. Therefore if butler was guilty then he got the cream. Prove statement no 4 using Resolution.	06
Q3 (b)	Short Note : Semantic Networks	04
Q4 (a)	Explain Total Order Planning with suitable example.	05
Q4 (b)	Explain different Fuzzy Membership Functions	05
Q5 (a)	Use bipolar continuous activation function to train the model. Calculate the weights change for one iteration. I/p training pairs of $(X_i, d_i)$ are as follows, $X_1 = [0 \quad -2 \quad 1 \quad -1]^t \quad d_1 = -1$ $X_2 = [1 \quad 1.5 \quad -0.5 \quad -1]^t \quad d_2 = -1$ $X_3 = [-1 \quad 1 \quad 0.5 \quad -1]^t \quad d_3 = 1$ Other required parameters are, Weight vector is $W_1 = [0 \quad -1 \quad 1 \quad 0.5]^t$ Learning Constant= $C= 0.1$ Steepness Coefficient= $\lambda=1$	05
Q5 (b)	Explain Single Discrete Perceptron Training Algorithm with flowchart.	05
Q6	Write a short note on (any two) a) Explain phases in building Expert Systems b) Ant Colony Optimization c) Simulated Annealing	05

All the Best!

3 Hours

Total Marks = 80

**Note:**

- (i) Each question carries 20 marks
- (ii) Question 1 is compulsory
- (iii) Attempt **any three (3)** from the remaining questions
- (iv) Assume suitable data wherever required

Q1 Attempt **any four (4)** questions from the following [20]

- (a) Give PEAS description for a **Self Driving Car** agent. Characterize its environment.
- (b) Give the initial state, goal test, successor function, and cost function for the **Travelling salesman problem**
- (c) What will be the job of each of the components (Performance element, Learning element, Critic and problem generator) of learning agent?
- (d) Consider an 8 puzzle problem with the following initial state and goal state.

7	2	4
5		6
8	3	1
Initial State		

	1	2
3	4	5
6	7	8
Goal State		

- Generate successors at next two levels. Apply number of misplaced tiles as the heuristic function. Which successor nodes will be selected at each level if we apply Hill climbing algorithm?
- (e) Convert the following English sentence into predicate logic and then into CNF  
**“The culprit was tall and dark”**

Q2 (a) Explain decision tree learning with an example. What are decision rules? How to use it for classifying new samples? [10]

- (b) Write first order logic equivalent of the following statements: [10]
  - (i) Anand likes only comedy films.
  - (ii) The culprit has to be one from Tinker, Tailor and Butler.
  - (iii) Whoever can read is literate.
  - (iv) Every child loves Santa.
  - (v) Some birds cannot fly.

Q3 (a) Design a classical planner for air cargo transportation problem using STRIPS. The problem involves loading, unloading cargo and flying it from place to place. Define three actions: Load, Unload and Fly. The actions affect two predicates: In(c, p) means that cargo c inside plane p, and At(x, a) means that object x (either plane or cargo) is at airport a. [10]

- (b) Give a formal definition of a Bayesian Belief Network (BBN). Illustrate the process of constructing a BBN with a suitable scenario. What type of inferences can be drawn from BBN network? [10]

Q4 (a) Compare **Breadth first search (BFS)**, **Depth first search (DFS)**, **Depth limited search (DLS)** and **Iterative Deepening search** algorithms based on performance measure with justification: Complete, Optimal, Time and Space complexity. PTO [10]

- (b) Write a pseudo code for alpha-beta algorithm. Apply alpha-beta pruning on example [10]

given in Figure 1 considering first node as max.

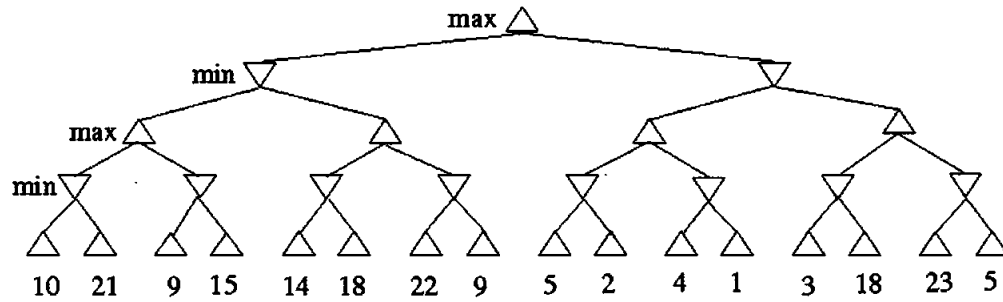


Figure 1

- Q5 (a) How will you convert the propositional logic statement into CNF? Give a suitable example at each step? [10]
- (b) Consider the graph given in Figure 2 below. Assume that the initial state is **S** and the goal state is **G**. Show how **A\* Search** would create a search tree to find a path from the initial state to the goal state: [10]

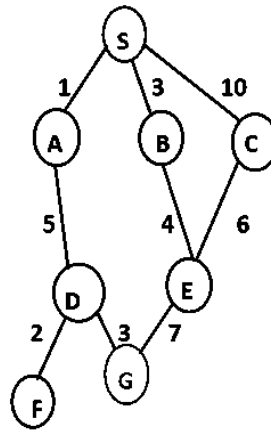


Figure 2

At each step of the search algorithm, show which node is being expanded, and the content of fringe (OPEN). Also report the eventual solution found by the algorithm, and the solution cost. Assuming the straight-line distance as the heuristics function:  $h(S)=13$ ,  $h(A)=7$ ,  $h(B)=9$ ,  $h(C)=11$ ,  $h(D)=2$ ,  $h(E)=4$ ,  $h(F)=1$ , and  $h(G)=0$ .

- Q6 Answer any two (2) of the following [20]
- (a) What are the steps involved in natural language processing (NLP) of an English sentence? Explain with an example sentence.
- (b) Draw and describe each component in the Architecture of Expert System with a suitable example
- (c) Explain how Genetic algorithms work. Define the terms chromosome, fitness function, crossover and mutation as used in Genetic algorithms

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