

CHAROTAR UNIVERSITY OF SCIENCE & TECHNOLOGY**Sixth Semester of B. Tech Examination (IT)****May 2018****IT321 Intelligent System****Date: 10.05.2018, Thursday****Time: 10:00 a.m. to 01:00 p.m.****Maximum Marks:70****Instructions:**

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION-I**Q-1 Do as directed.****[07]**

1. Evaluate good heuristic function and solve given 8-tile-puzzle using any informed search technique. [02]

2	8	3
1	6	4
7		5

Initial

1	2	3
8		4
7	6	5

Goal

2. Consider given table and calculate precision & recall measurement rates for binary classifier. [02]

n = 165	Predicted: No	Predicted: Yes
	Actual: No	Tn =50
Actual: Yes	Fn=5	Tp=100

3. Match the following: [03]

A	Breadth first search	1	Increasing no. of iterations used to train network
B	K-means algorithm terminates when	2	To search and measure how far a node in a search tree seems to be from a goal
C	Iterative Deepening	3	Search strategy is implemented with an empty first-in-first-out queue
D	Heuristic function	4	Supervised network does not contain a hidden layer
E	Increase the accuracy of network	5	Combines depth-first search's space-efficiency and breadth-first search's fast search
F	Perceptron	6	No more pixels are changing classes

- Q-2 (a) Determine optimal hyper plane for SVM model $y = wx + b$ considering given augmented vectors $s_1 = [0 \ -1 \ 1]$ $s_2 = [0 \ 1 \ 1]$ $s_3 = [2 \ 0 \ 1]$ using linear support vector machine algorithm. [04]

- Q-2 (b) Answer the following questions.(Any Two) [10]

1. What is iterative deepening? Traverse given graph using iterative deepening search strategy. Show the contents of OPEN and CLOSED list. Consider node A as a starting node and T as a goal node as shown in fig.1 below.

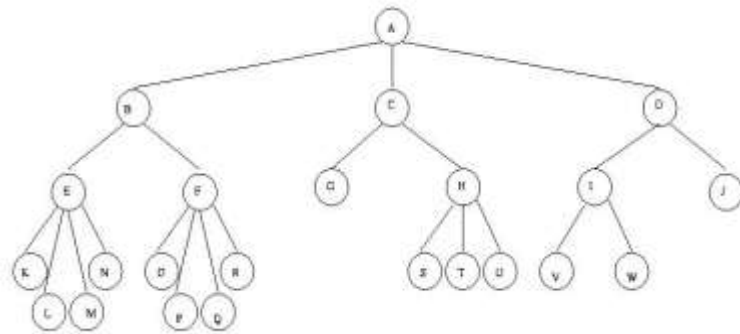


Fig. 1

2. Demonstrate and determine linear regression model for given dataset using linear regression algorithm.

X	Y
1	2
2	4
3	5
4	4
5	5

3. Consider given multilayer perceptron and classical exclusive-or logic function has two inputs and one output as shown in fig.2 below.

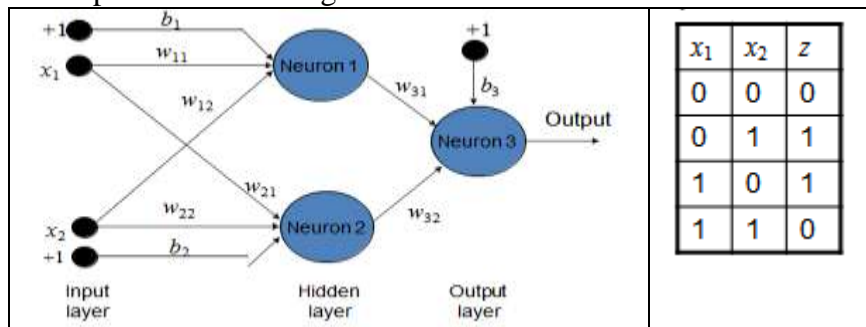


Fig. 2

Solve XOR problem using multilayer perceptron algorithm for all truth table samples. Take given weights and bias values $w_{11}=w_{12}=w_{21}=w_{22}=w_{32}=+1$, $w_{31}=-2$, $b_1=-1.5$, $b_2=b_3=-0.5$ & threshold function as an activation function as below.

$$\varphi(v) = \begin{cases} 1 & \text{if } v \geq 0 \\ 0 & \text{if } v < 0 \end{cases}$$

4. Show the working of AO* algorithm of given graph as shown in fig.3 below that progressively increase in alphabetical order. Find best path and revise the cost of root node by progressively expanding every nodes.

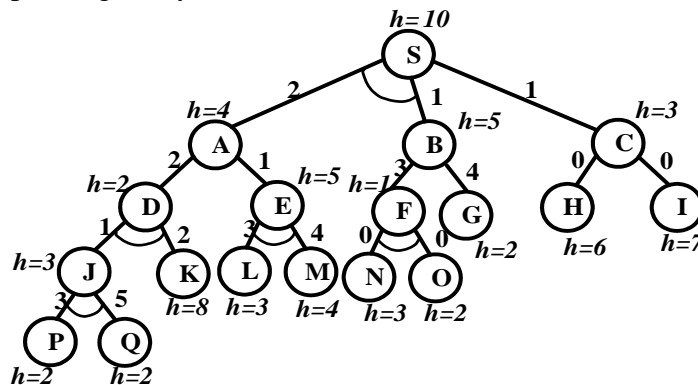


Fig.3

Q-3 Answer the following questions.(Any Two)

[14]

- Show the contents of OPEN and CLOSED list for given graph as shown in fig.4 below using A* algorithm.

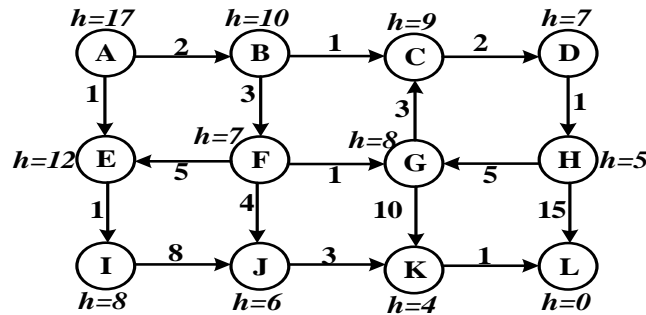


Fig. 4

- A patient has been suffering from shortness of breath (called dyspnoea) and visits the doctor, worried that he has lung cancer. The doctor knows that other diseases, such as tuberculosis and bronchitis are possible causes, as well as lung cancer. She also knows that other relevant information includes whether or not the patient is a smoker and what sort of air pollution he has been exposed to. A positive XRay would indicate either TB or lung cancer.

The relevant probabilities are given in the Bayes network here as shown in fig. 5 below. Calculate $p(\text{Pollution} \mid \text{XRy})$.

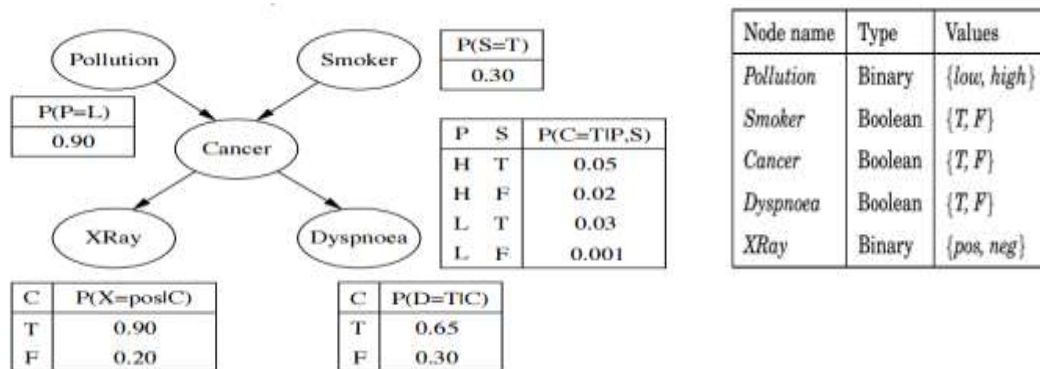


Fig. 5

- Perform a complete forward & backward step of the feed forward network 2-2-1 architecture using back propagation algorithm. Take below fig.6 as input and train the given network for output node3 and calculate new values of weight w_{31} & bias b_3 . Assume, target output=0.9, $\eta=0.25$, $\alpha=0.0001$ and sigmoid function as below.

$$\phi(v) = \frac{1}{1 + \exp(-v)}$$

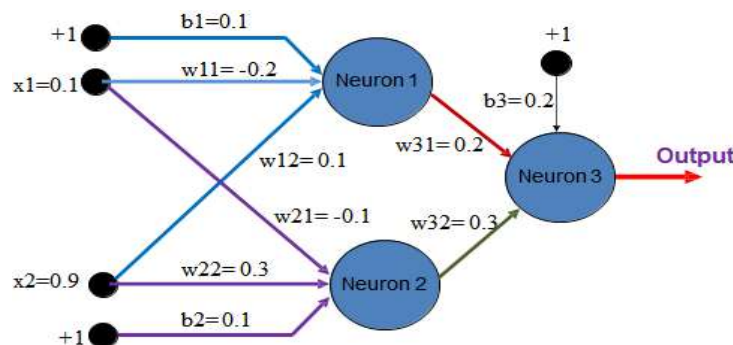


Fig. 6

SECTION-II

- Q-4 Do as directed.** [07]
- Which of the following is a tautology? [01]

a) $P \vee Q \Rightarrow Q$	b) $P \vee (Q \Rightarrow P)$
c) $P \vee (P \Rightarrow Q)$	d) Bot (b) and (c)
 - Which of the following propositional formulas represents the sentence, 'He will come on the 8:15 or the 9:15 train; if the former, he will have time to visit us', Where, p means 'He will come on the 8:15', q means 'He will come on the 9:15', r means 'He will have time to visit us' [01]

a) $\neg p \rightarrow q \vee r$	b) $p \vee q \rightarrow r$
c) $(p \rightarrow q) \wedge (p \vee r)$	d) $p \vee \neg q \rightarrow r$
e) $(p \vee q) \wedge (p \rightarrow r)$	
 - What is a Horn Clause? Give an example. [02]
 - Consider the following sentences [03]

If the unicorn is mythical, then it is immortal, but if it is not mythical, then it is a mortal mammal. If the unicorn is either immortal or a mammal, then it is horned. The unicorn is magical if it is horned.

Convert the English into propositional logic implicative form and conjunctive normal form (CNF).
- Q-5 (a)** What do you mean by expert system? What are the major components of it? Elaborate on any one in detail. [04]
- Q-5 (b)** Answer the following questions.(Any Two) [10]
- Consider the following knowledge base with given facts and rules. Prove that Goal 'Q' is true using forward and backward chaining.

R1: $P \Rightarrow Q$
 R2: $L \wedge M \Rightarrow P$
 R3: $B \wedge L \Rightarrow M$
 R4: $A \wedge P \Rightarrow L$
 R5: $A \wedge B \Rightarrow L$

F1:A
 F2:B
 - A four person family wants to buy a house. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ be the set of available houses described by their number of bedrooms. Let $C = \{0.2/1, 0.5/2, 0.8/3, 1/4, 0.7/5, 0.3/6, 0/7, 0/8, 0/9, 0/10\}$ be a fuzzy set indicating how comfortable they are in the house. Let $L = \{0/1, 0/2, 0.2/3, 0.4/4, 0.6/5, 0.8/6, 1/7, 1/8, 1/9, 1/10\}$ be the fuzzy set indicating how large the house is. The family wants to buy that house which is both comfortable and large.
 - Which house according to the fuzzy system should the family buy?
 - Generate the Concentration set of houses which are both comfortable and large. Hint: The house which is both comfortable and large with highest membership function has highest probability of sale.
 - When do we need pragmatic analysis? Why it is considered to be most difficult stage of natural language processing?

4. Assume the following sentences. Convert them into Predicate Logic.

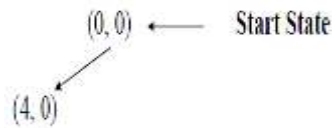
- Steve only likes easy courses.
- Science courses are hard.
- All the courses in the basket weaving department are easy.
- BK301 is a basket weaving course.

Use Resolution to answer the question “What course would Steve like?” Hint: hard means not easy.

Q-6 Answer the following questions.(Any Two)

[14]

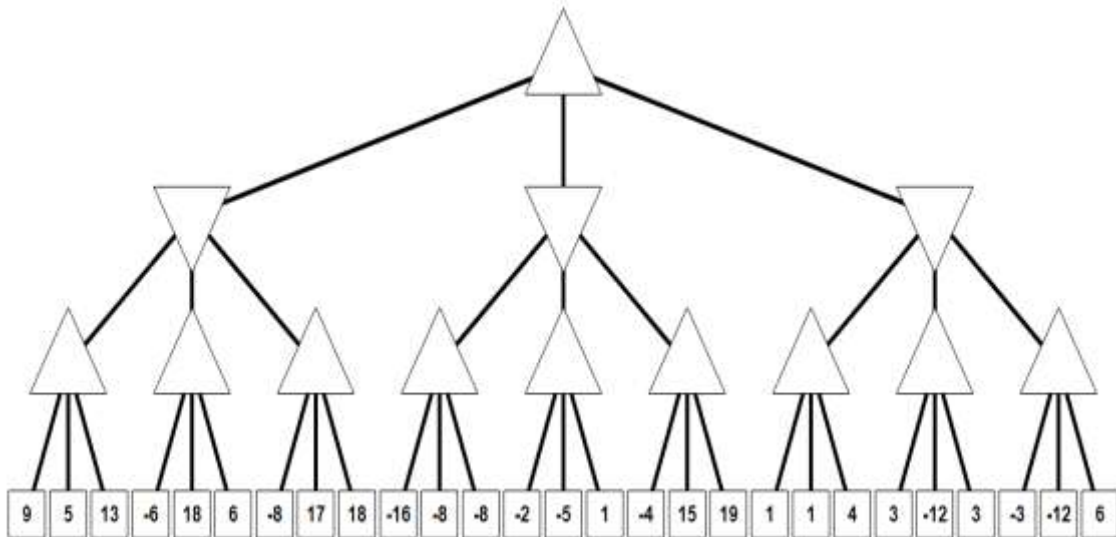
1.
 - i) Discuss Hill Climbing and its limitations with neat sketch diagram.
 - ii) Show the state space for given problem using Breadth first search.
Given two jugs of 4-gallon and 3-gallon respectively, how can you get exactly 2 liters of water into 4-litre jug? Consider Initial configuration of state space is



2. Define Cryptarithmic problem. Trace the constraints satisfaction procedure step by step for solving the following cryptarithmic problem:

$$\begin{array}{r}
 \text{Z E R O} \\
 + \text{ P O I N T} \\
 \hline
 \text{E N E R G Y}
 \end{array}$$

3. Consider the following game tree in which static scores are all from the first player's point of view:



Suppose the first player is the maximizing player. Which move should be chosen? And How many nodes would not need to be examined using the alpha-beta pruning procedure?
