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THE NATIONAL INSTITUTE OF ENGINEERING, MYSURU – 8
(An Autonomous Institute Affiliated to VTU, Belagavi)

Eighth Semester B.E. Degree Makeup Term Examination, July 2018

EC0442 — **Artificial Intelligence**

Time: 3 Hrs — Max. Marks: 100

Note: Answer all the questions.

Q. No.	Cognt. Level	COs	Questions	Marks
1. a)	L2	CO1	Briefly classify the branches of Artificial Intelligence?	7
b)	L3	CO1	Model the goal tree for the following problem. A man with a Fox (F), Rabbit (R) and Carrot (C) have to cross a river by a Boat. The boat can carry only two of them. Constraint is that fox will eat the rabbit if they are left alone. Rabbit will eat the carrots if it is left alone. Without losing anybody / thing all three must cross the river to the other side. Using F, R, C, M show the goal tree starting as (FRCM)( ). The first left bracket is left shore the empty( ) as the right shore. The final representation is ( ) (FRCM) (FRCM) ( ) → ( ) (FRCM)	8
2. a)	L4	CO2	As you are getting close to graduating at NIE, you decided to some career planning. You created a graph of your options where the start node is N = NIE and your goal is R = Retire, with a bunch of options in between. Your graph includes edge distances that represent roughly, the "cost of transitions" between these careers (don't think too hard how this means). You also have heuristic node-to-goal distances which represent you pre-conceptions about how many more years you have-to work until you retire. For Eg., you think it will take 25 years to go from NIE (N) to retirement ®, 30 years from Grad school (B), but only 2 years from Entrepreneur (E). A = Dalal street, B = Grad school, C = Professor, D = Government, E = Entrepreneur. In all search problems, use alphabetical order to break ties when deciding the priority to use for extending nodes. Use Fig. Q. 2(a) a) Using breadth-first-search mention the path, which path is the least cost path? b) Now you are interested in finding a path and the associated distance. Try beam search with a width w = 2, with an extended list. As before, you are looking for a path from N to R. Use the "Preconceptions" heuristic distances indicated in parenthesis at each node. Write the tree, path and the extended list to 'R.	5 10
			OR	

<table>
<tr><td>2. b)</td><td>L2</td><td>CO2</td><td>Explain the searches with examples of your own (let them be meaningful)
i) Depth-first search
ii) Breadth-first search
iii) Hill-climbing search
iv) Beam search.</td><td>8</td></tr>
<tr><td>c)</td><td>L4</td><td>CO2</td><td>PO → If (AND (?x is old, ?x is a teacher),
OR (?x is a good shooter)
Then ?x is a well-wisher of pancham
P1 → If (?x is defeated by ? y AND.
?y is a Muscleman)
OR (?y is a voracious eater)
Then ?y is a pancham
P2 → If (?x can withdraw weapons)
Then (?x is a good shooter)
P3 → If (?x charms Girls)
Then ?x controls elements
P4 → If (?x has Lamborgini) OR
(?x controls elements)
Then ?x is a Racer
P5 → If (OR (?x controls elements,
?x is a well-wisher of pancham)
AND (?x is a racer)
Then ?x is “THE ONE”.
Assertions:
Aϕ: Bhimboy roars like a lion.
A1: Kris withdraws weapons.
A2: Screech is defeated by Bhimboy
A3: DJ withdraws weapons
A4: Kris has Lamborgini
A5: DJ charms girls.
Simulate backward chaining with the hypothesis.
KRIS is “THE ONE”
Draw the goal tree that would be generated by backward chaining.
And write all the hypothesis the backward chainer looks for in the given rules and assertions.</td><td>7</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td>3. a)</td><td>L5</td><td>CO3</td><td>Solve this using CSP, find the values of the variables.
M O O N
N O O N
S O O N
J U N E</td><td>8</td></tr>
<tr><td>b)</td><td>L4</td><td>CO3</td><td>Explain the constraint satisfaction problem (CSP), strategy? (variables, domain and constraints).
And solve the 4 – queen problem using the propagation table as given.
<table>
<tr><th>Propagation Queue</th><th>Var assigned or propagated</th><th>Values eliminated from neighbour</th><th>Backtrack (Y/N)</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table></td><td>3
4</td></tr>
</table>

4. a)	L3	CO4	Journalist Pranav from Ennada-TV wanted to find the voters choice in a particular area and he has got samples from his team, but they have lost the information as to which side they are supporting Hastha or Kamala. But he got a table with unknown points indicating square points 1, 2, 3 and 4. Based on the table he still needs to find point 4. (use Fig. Q. 4a)	

Point	Using 1-NN	Using 3-NN
1	Hastha	Kamala
2	Kamala	Hastha
3	Kamala	Kamala
4	?	?

a) Identify / classify the following specimens as Hastha(H) or Kamala(K) or Unknown (U) circle — 2

A) _____ B) _____ C) _____ D) _____
E) _____ F) _____ G) _____ H) _____
I) _____ J) _____

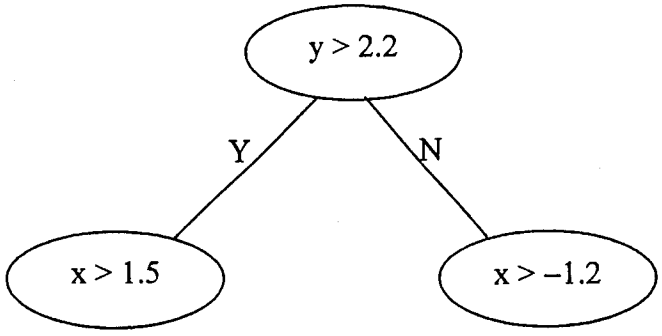
b) How would point 4 be classified as (H, K or U) — 2

i) using 1 – NN
ii) using 3 – NN

The town where the census of voters were taken started to have a fight and the police commissioner wanted to put a curfew along the border of these two group of voters (use Fig. Q. 4b)

c) Use Fig. Q. 4(b) for the question following: ACP of the station says its put a battalion of police at y = 1.5. Draw the decision boundary and calculate the disorder. — 6

d) Use Fig. Q. 4(b) — 5



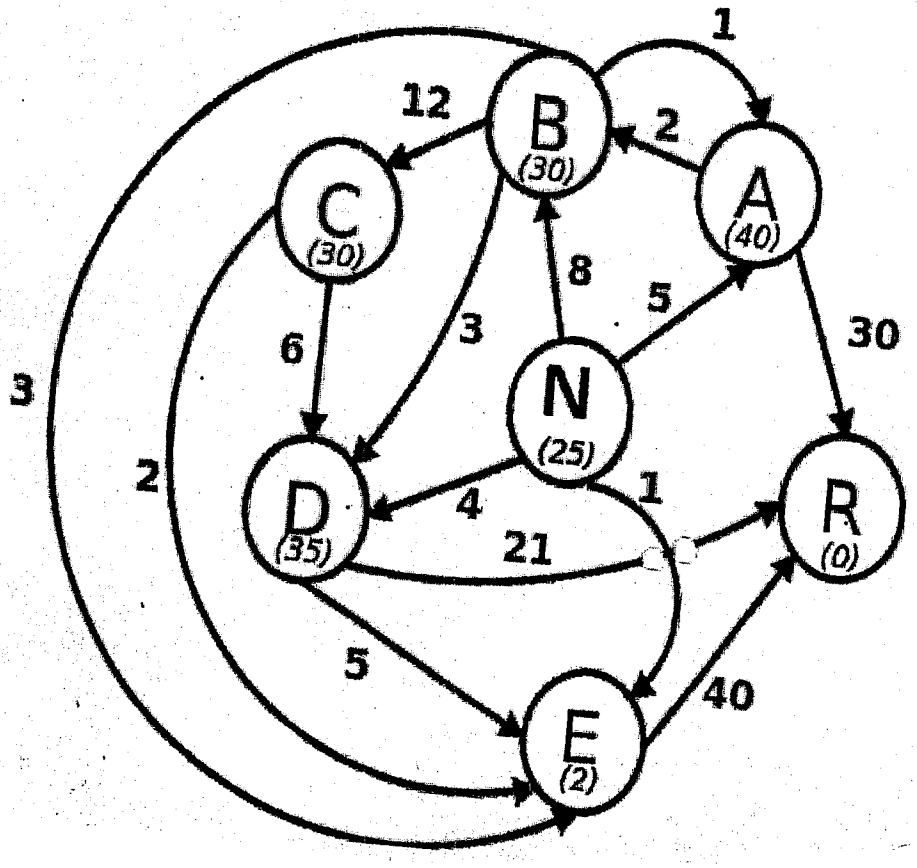
Draw the decision boundary.

OR

4. b)	L2	CO4	i) What are the different types of learning?	3
	L4	CO4	ii) Disorder in an ID-Tree is calculated based on some formula borrowed from information theory? Briefly explain the disorder theory.	7
			iii) Use Fig. Q. 4(c) for 3rd question	
	L4	CO4	If a test is done based on (Hardness > 3.5), find the disorder of the set.	5
5. a)	L2	CO5	Illustrate how neural networks work in the context of AI?	7

b)	L4	CO5	Taking a single neuron, using McCulloch-Pitt model train a neural network to learn the OR logic function, when Threshold T = 0.5 using $O = sig(X) = \frac{1}{1+e^{-(X-T)}}$ when weight $w_1 = 1$ and $w_2 = 1$	8
6. a)	L3	CO6	Derive the margin between the support vectors. $r = \frac{2}{\|W\|^2}$	7
b)	L3	CO6	Draw the decision boundary, the gutters and circle the support vectors. Determine the w & b of the graph in Fig. Q. 6(b) $(h(x) = \vec{w}x + b)$	8
7. a)	L2		Write one or two sentences, where would Rule-Based expert systems can be used.	2
b)	L1		Mention the 5-points of methodology.	3
c)	L2		How to isolate suspicious relations using FIXIT (true-success suspicious relations only)	2
d)	L2		Explain briefly how Ada Boosting works.	3

Fig 2a



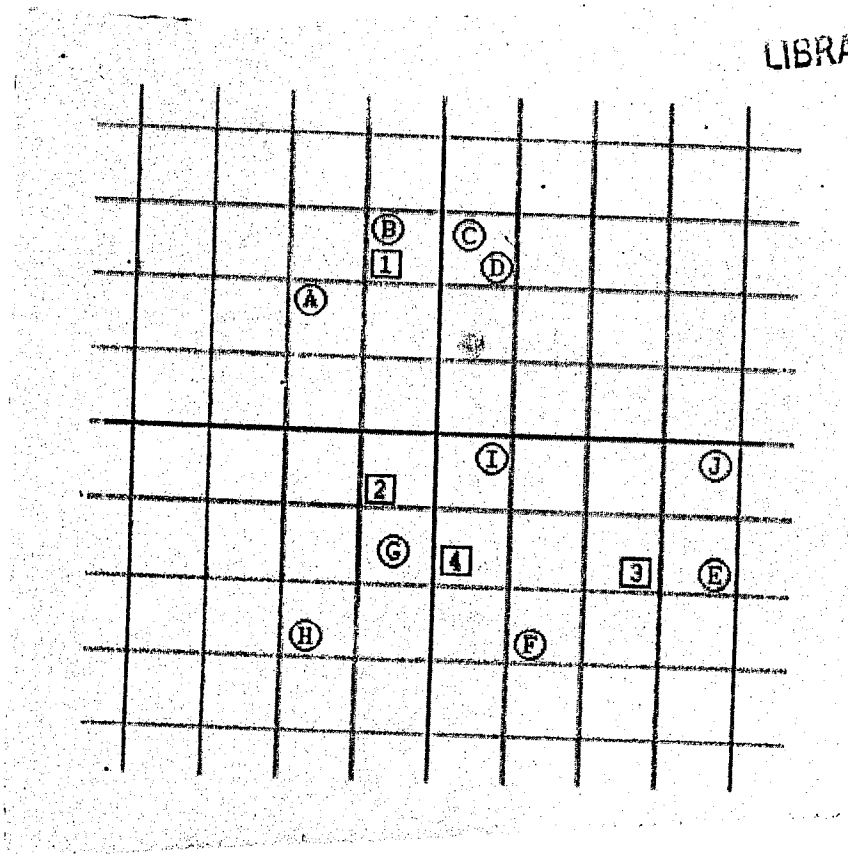


Fig. 4(a)

Fig(4b)

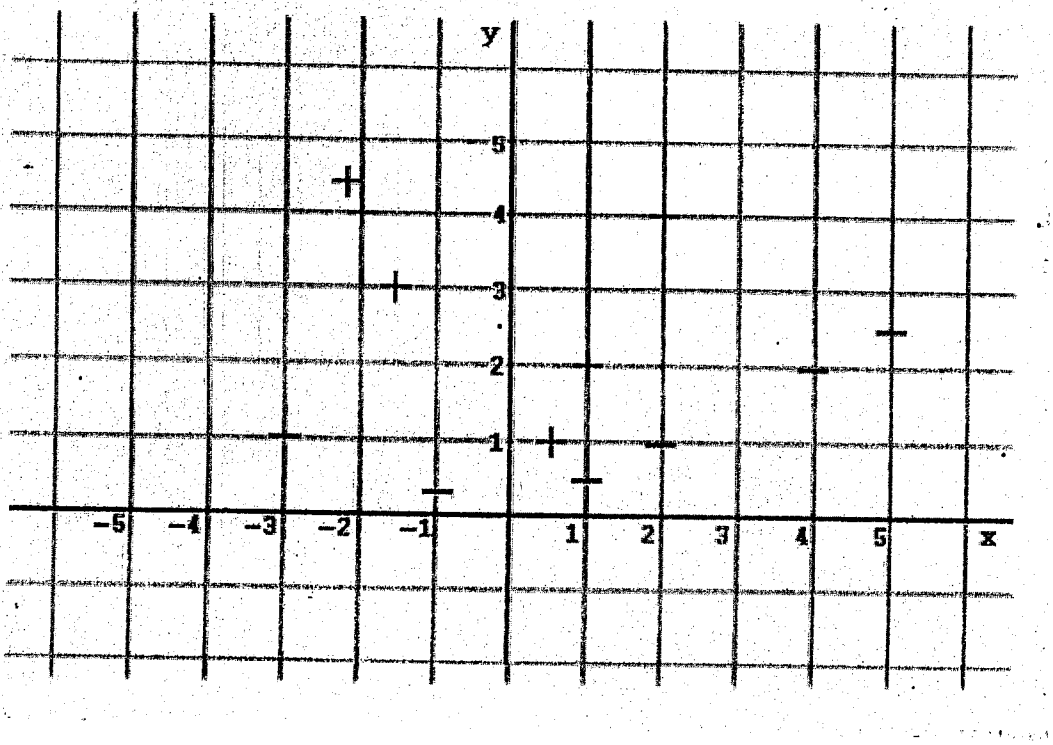
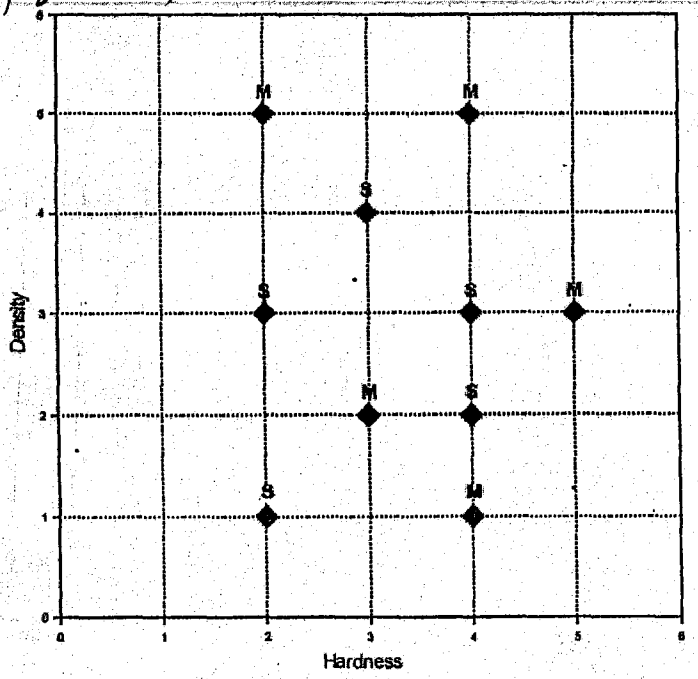


fig (4c)



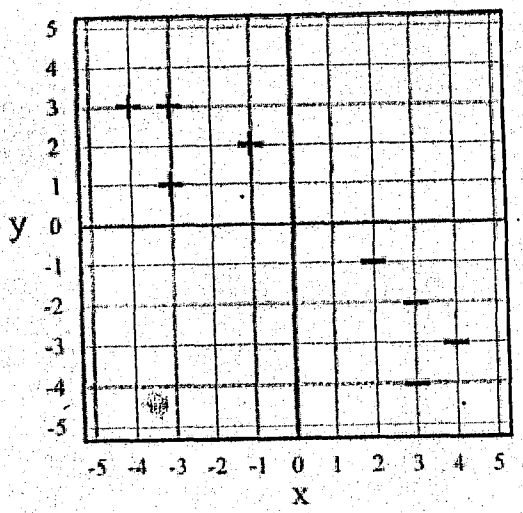


Fig. 6(b)