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Code No. : 15232 S

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (C.S.E.) V-Semester Main & Backlog Examinations, June-2022

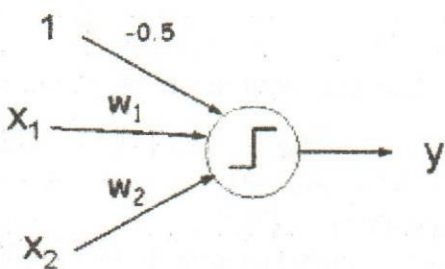
Machine Learning

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO																														
1.	Write the task, performance measure and training experience E for automatic robot driving.	2	1	1	1																														
2.	Find the Hypothesis which best fits the given set of samples using FIND-S algorithm	2	2	1	2																														
	<table border="1"> <thead> <tr> <th>Day</th> <th>Outlook</th> <th>Temperature</th> <th>Humidity</th> <th>Wind</th> <th>PlayTennis</th> </tr> </thead> <tbody> <tr> <td>D1</td> <td>Sunny</td> <td>Hot</td> <td>High</td> <td>Weak</td> <td>No</td> </tr> <tr> <td>D2</td> <td>Sunny</td> <td>Hot</td> <td>High</td> <td>Strong</td> <td>No</td> </tr> <tr> <td>D3</td> <td>Overcast</td> <td>Hot</td> <td>High</td> <td>Weak</td> <td>Yes</td> </tr> <tr> <td>D4</td> <td>Rain</td> <td>Mild</td> <td>High</td> <td>Weak</td> <td>Yes</td> </tr> </tbody> </table>	Day	Outlook	Temperature	Humidity	Wind	PlayTennis	D1	Sunny	Hot	High	Weak	No	D2	Sunny	Hot	High	Strong	No	D3	Overcast	Hot	High	Weak	Yes	D4	Rain	Mild	High	Weak	Yes				
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3.	Suppose data sample S contains n=60 examples and hypothesis h commits 10 errors over this data. Find the range of values for the true error with 95% confidence interval, where $Z_{95}=1.96$	2	3	2	2																														
4.	<p>The neural network given bellow takes two binary valued inputs $x_1, x_2 = \{0,1\}$ and the activation function is the binary threshold function ($h(x)=1$ if $x > 0$; 0 otherwise). Which logical functions does it compute?</p> 	2	2	2	2																														
5.	Consider a hypothesis space containing three hypotheses, $h_1, h_2,$ and h_3 . Suppose that the posterior probabilities of these hypotheses given the training data are .4, .3, and .3 respectively. Suppose a new instance x is encountered, which is classified positive by h_1 , but negative by h_2 and h_3 . Taking all hypotheses into account classify new instance based on Bayes optimal classifier.	2	3	3	2																														
6.	Consider an instance space X which is the set of real numbers and H be the set of intervals on the real number line i.e. set of hypotheses of the form $a < x < b$, where a and b may be any real constants. What is VC(H)?	2	2	3	2																														

7.	What is curse of dimensionality? Write the approaches to overcome this problem.	2	1	4	2																																																																		
8.	Calculate the Euclidean Distance between the two data point D1(4,3,6) and D2(2,6,9)?	2	3	4	2																																																																		
9.	Find the new population after cross over of the string and mutating the 5 th bit S1 = <u>1100011000</u> S2 = <u>1111100111</u>	2	3	5	2																																																																		
10.	Given an input image of dimension 256 X 256 convolves with filter of size 5 X 5 and takes the Stride as 1 with no padding. After these operations, find the dimension of the output image Part-B (5×8 = 40 Marks)	2	3	5	2																																																																		
11. a)	Design learning program for checkers game.	4	1	1	2																																																																		
b)	Consider the trading agent trying to infer which books or articles the user reads based on keywords supplied in the article. Suppose the learning agent has the following data: <table border="1"> <thead> <tr> <th>Article</th> <th>Crime</th> <th>Academic</th> <th>Local</th> <th>Music</th> <th>Reads</th> </tr> </thead> <tbody> <tr> <td>a1</td> <td>true</td> <td>false</td> <td>false</td> <td>true</td> <td>true</td> </tr> <tr> <td>a2</td> <td>true</td> <td>false</td> <td>false</td> <td>false</td> <td>true</td> </tr> <tr> <td>a3</td> <td>false</td> <td>true</td> <td>false</td> <td>false</td> <td>false</td> </tr> <tr> <td>a4</td> <td>false</td> <td>false</td> <td>true</td> <td>false</td> <td>false</td> </tr> <tr> <td>a5</td> <td>true</td> <td>true</td> <td>false</td> <td>false</td> <td>true</td> </tr> </tbody> </table> <p>Find which articles the user reads. Using candidate elimination algorithm.</p>	Article	Crime	Academic	Local	Music	Reads	a1	true	false	false	true	true	a2	true	false	false	false	true	a3	false	true	false	false	false	a4	false	false	true	false	false	a5	true	true	false	false	true	4	3	1	2																														
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12. a)	What is Perceptron ? Explain the perceptron learning with neat diagram.	4	1	2	1																																																																		
b)	NASA wants to be able to discriminate between Martians (M) and Humans (H) based on the following characteristics: Green ∈ {N, Y} , Legs ∈ {2,3} , Height ∈ {S, T}, Smelly ∈ {N, Y} Our available training data is as follows: <table border="1"> <thead> <tr> <th></th> <th>Species</th> <th>Green</th> <th>Legs</th> <th>Height</th> <th>Smelly</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>M</td> <td>N</td> <td>3</td> <td>S</td> <td>Y</td> </tr> <tr> <td>2</td> <td>M</td> <td>Y</td> <td>2</td> <td>T</td> <td>N</td> </tr> <tr> <td>3</td> <td>M</td> <td>Y</td> <td>3</td> <td>T</td> <td>N</td> </tr> <tr> <td>4</td> <td>M</td> <td>N</td> <td>2</td> <td>S</td> <td>Y</td> </tr> <tr> <td>5</td> <td>M</td> <td>Y</td> <td>3</td> <td>T</td> <td>N</td> </tr> <tr> <td>6</td> <td>H</td> <td>N</td> <td>2</td> <td>T</td> <td>Y</td> </tr> <tr> <td>7</td> <td>H</td> <td>N</td> <td>2</td> <td>S</td> <td>N</td> </tr> <tr> <td>8</td> <td>H</td> <td>N</td> <td>2</td> <td>T</td> <td>N</td> </tr> <tr> <td>9</td> <td>H</td> <td>Y</td> <td>2</td> <td>S</td> <td>N</td> </tr> <tr> <td>10</td> <td>H</td> <td>N</td> <td>2</td> <td>T</td> <td>Y</td> </tr> </tbody> </table> <p>Draw decision tree using the ID3 algorithm.</p>		Species	Green	Legs	Height	Smelly	1	M	N	3	S	Y	2	M	Y	2	T	N	3	M	Y	3	T	N	4	M	N	2	S	Y	5	M	Y	3	T	N	6	H	N	2	T	Y	7	H	N	2	S	N	8	H	N	2	T	N	9	H	Y	2	S	N	10	H	N	2	T	Y	4	3	2	2
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13. a)	When you can say concept class C defined over a set of instances X as PAC-learnable?	3 2 3 2																																																
b)	<p>Consider the training data in the following table where Play is a class attribute. In the table, the Humidity attribute has values "L" (for low) or "H" (for high), Sunny has values "Y" (for yes) or "N" (for no), Wind has values "S" (for strong) or "W" (for weak), and Play has values "Yes" or "No".</p> <p>What is class label for the following day (Humidity=L, Sunny=N, Wind=W), according to naïve Bayesian classification?</p> <table border="1"> <thead> <tr> <th>Humidity</th> <th>Sunny</th> <th>Wind</th> <th>Play</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>N</td> <td>S</td> <td>NO</td> </tr> <tr> <td>H</td> <td>N</td> <td>W</td> <td>YES</td> </tr> <tr> <td>H</td> <td>Y</td> <td>S</td> <td>YES</td> </tr> <tr> <td>H</td> <td>N</td> <td>W</td> <td>YES</td> </tr> <tr> <td>L</td> <td>Y</td> <td>S</td> <td>NO</td> </tr> </tbody> </table>	Humidity	Sunny	Wind	Play	L	N	S	NO	H	N	W	YES	H	Y	S	YES	H	N	W	YES	L	Y	S	NO	5 3 3 2																								
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14. a)	Show how Case Based Reasoning can be used for designing water faucets	4 3 4 2																																																
b)	<p>Given the relation between the height age and weight as below.</p> <table border="1"> <thead> <tr> <th>ID</th> <th>Height</th> <th>Age</th> <th>Weight</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>5</td> <td>45</td> <td>77</td> </tr> <tr> <td>2</td> <td>5.11</td> <td>26</td> <td>47</td> </tr> <tr> <td>3</td> <td>5.6</td> <td>30</td> <td>55</td> </tr> <tr> <td>4</td> <td>5.9</td> <td>34</td> <td>59</td> </tr> <tr> <td>5</td> <td>4.8</td> <td>40</td> <td>72</td> </tr> <tr> <td>6</td> <td>5.8</td> <td>36</td> <td>60</td> </tr> <tr> <td>7</td> <td>5.3</td> <td>19</td> <td>40</td> </tr> <tr> <td>8</td> <td>5.8</td> <td>28</td> <td>60</td> </tr> <tr> <td>9</td> <td>5.5</td> <td>23</td> <td>45</td> </tr> <tr> <td>10</td> <td>5.6</td> <td>32</td> <td>58</td> </tr> <tr> <td>11</td> <td>5.5</td> <td>38</td> <td>?</td> </tr> </tbody> </table> <p>The weight value of ID11 is missing. Predict the weight of this person based on their height and age, using KNN algorithm with k=4.</p>	ID	Height	Age	Weight	1	5	45	77	2	5.11	26	47	3	5.6	30	55	4	5.9	34	59	5	4.8	40	72	6	5.8	36	60	7	5.3	19	40	8	5.8	28	60	9	5.5	23	45	10	5.6	32	58	11	5.5	38	?	4 2 4 2
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15. a)	Describe the application of genetic program to solve stacking the blocks problem.	4 2 5 2																																																
b)	Explain the Convolution Neural Network with neat diagram	4 1 5 2																																																

16. a)	Find the General Boundary G and specific boundary S for the set of examples	4	3	1	2																																			
<table border="1"> <thead> <tr> <th>Sky</th> <th>Temp</th> <th>Humid</th> <th>Wind</th> <th>Water</th> <th>Forecst</th> <th>EnjoySpt</th> </tr> </thead> <tbody> <tr> <td>Sunny</td> <td>Warm</td> <td>Normal</td> <td>Strong</td> <td>Warm</td> <td>Same</td> <td>Yes</td> </tr> <tr> <td>Sunny</td> <td>Warm</td> <td>High</td> <td>Strong</td> <td>Warm</td> <td>Same</td> <td>Yes</td> </tr> <tr> <td>Rainy</td> <td>Cold</td> <td>High</td> <td>Strong</td> <td>Warm</td> <td>Change</td> <td>No</td> </tr> <tr> <td>Sunny</td> <td>Warm</td> <td>High</td> <td>Strong</td> <td>Cool</td> <td>Change</td> <td>Yes</td> </tr> </tbody> </table>						Sky	Temp	Humid	Wind	Water	Forecst	EnjoySpt	Sunny	Warm	Normal	Strong	Warm	Same	Yes	Sunny	Warm	High	Strong	Warm	Same	Yes	Rainy	Cold	High	Strong	Warm	Change	No	Sunny	Warm	High	Strong	Cool	Change	Yes
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b)	Explain the backpropagation algorithm used for multilayer feed forward network with neat diagram .	4	2	2	2																																			
17.	Answer any <i>two</i> of the following:																																							
a)	From the given table find the following probabilities $p(\text{toothache} \wedge \text{catch} / \text{cavity})$, $p(\text{cavity})$, $p(\text{cavity} \vee \text{toothache})$	4	3	3	2																																			
<table border="1"> <thead> <tr> <th></th> <th colspan="2">toothache</th> <th colspan="2">~toothache</th> </tr> <tr> <th></th> <th>catch</th> <th>~catch</th> <th>catch</th> <th>~catch</th> </tr> </thead> <tbody> <tr> <th>cavity</th> <td>.108</td> <td>.012</td> <td>.072</td> <td>.008</td> </tr> <tr> <th>~cavity</th> <td>.016</td> <td>.064</td> <td>.144</td> <td>.576</td> </tr> </tbody> </table>							toothache		~toothache			catch	~catch	catch	~catch	cavity	.108	.012	.072	.008	~cavity	.016	.064	.144	.576															
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b)	Describe the RBF network with neat diagram.	4	2	4	2																																			
c)	Explain the steps of genetic algorithms with example.	4	2	5	2																																			

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	36%
iii)	Blooms Taxonomy Level – 3 & 4	44%
