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Code No. : 14247

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (C.S.E./AIML) IV-Semester Main & Backlog Examinations, July-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 (P) and Training experience (E) for Handwriting recognition problem.	2	2	1	1,2																					
2.	Find which hypothesis shown below are consistent with data given as: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Example</th> <th>Citation</th> <th>Size</th> <th>InLibrary</th> <th>Price</th> <th>Editions</th> <th>Buy</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Some</td> <td>Small</td> <td>No</td> <td>Affordable</td> <td>One</td> <td>No</td> </tr> <tr> <td>2</td> <td>Many</td> <td>Big</td> <td>No</td> <td>Expensive</td> <td>Many</td> <td>Yes</td> </tr> </tbody> </table> H1= (?, ?, No, ?, Many) H2= (?, ?, No, ?, ?)	Example	Citation	Size	InLibrary	Price	Editions	Buy	1	Some	Small	No	Affordable	One	No	2	Many	Big	No	Expensive	Many	Yes	2	3	1	1,2
Example	Citation	Size	InLibrary	Price	Editions	Buy																				
1	Some	Small	No	Affordable	One	No																				
2	Many	Big	No	Expensive	Many	Yes																				
3.	Find the entropy of the dataset used for the Product Opinion analysis having 150 instances: where 80 are Labelled as positive instances, 70 are Labelled as negative instances	2	2	2	1,2																					
4.	Design a Neural network for implementing Logical NAND operation	2	3	2	1,2																					
5.	When you can say that concept class C defined over a set of instances X as PAC-learnable?	2	1	3	1,2																					
6.	Given that probability of the statement 'Anil has a viral' is 0.20. Probability of Anil being observed sneezing when he had viral is 0.8 and probability of Anil being observed sneezing when he did not have viral is 0.2. Find the probabilities of the following statements. i. Anil having viral if he is seen sneezing ii. Anil having viral if he is not sneezing	2	3	3	1,2																					
7.	Why do we need Locally weighted regression models for classification?	2	1	4	1,2																					
8.	Find the Euclidian distance between the two data instances having values for the 3 attributes X1=(5, 8, 6) and X2= (14, 5, 8).	2	3	4	1,2																					
9.	Represent the following If-Then rules by using Genetic Algorithms bit string notation. The list of attributes contributing to the target concept PlayTennis (Yes, No) is shown below. Outlook= {Sunny, Overcast, Rainy}, Temperature= {Hot, Mild, Cool}, Humidity= {High, Normal}, Wind= {Weak, Strong} Rule 1: IF (Outlook=Rainy and Wind=Strong) THEN PlayTennis :No Rule 2: IF ((Outlook = Overcast OR Rainy) and Humidity=High) THEN PLayTennis: No	2	3	5	1,2																					

10. Given an input image of dimension 1024 X1024 convolves with filter of size 3 X 3 and takes the Stride as 2 with no padding. After these operations, find the dimension of the output image.

2 3 5 1,2

Part-B (5×8 = 40 Marks)

11. a) Explain the design steps of Checkers learning program with a diagram.

4 2 1 1,2

b) Trace the FIND-S algorithm using the below sample set.

4 3 1 1,2

Num	Restaurant	Meal	Day	Cost	Reaction
1	The Nines	bkfst	Fri	\$	sick (+)
2	Banfis	lunch	Fri	\$\$	ok (-)
3	The Nines	lunch	Sat	\$	sick (+)
4	Moosewood	bkfst	Sun	\$	ok (-)
5	The Nines	bkfst	Sun	\$\$	ok (-)

12. a) What is the need for Multi-layer feed-forward network? Explain Learning Multi-layer feed-forward network with Backpropogation algorithm.

4 1 2 1,2

b) Consider the following dataset. Which attribute will be selected at the root node to classify the data accurately in Decision tree learning algorithm?

4 3 2 1,2

RID	age	income	student	credit_rating	Class: buys_computer
1	youth	high	no	fair	no
2	youth	high	no	excellent	no
3	middle_aged	high	no	fair	yes
4	senior	medium	no	fair	yes
5	senior	low	yes	fair	yes
6	senior	low	yes	excellent	no
7	middle_aged	low	yes	excellent	yes
8	youth	medium	no	fair	no
9	youth	low	yes	fair	yes
10	senior	medium	yes	fair	yes
11	youth	medium	yes	excellent	yes
12	middle_aged	medium	no	excellent	yes
13	middle_aged	high	yes	fair	yes
14	senior	medium	no	excellent	no

13. a) If H is the set of hypotheses of the form $a < x < b$, where a and b may be any real constants. What is VC(H)? Justify your answer with example.

4 3 3 1,2

b) We want to design a troubleshooting advisor for PCs. Let CF be a Boolean random variable representing whether the computer fails or not. Assume there are two possible causes of failure: Electricity-failure and Malfunction-of-computer, represented using the Boolean random variables EF and MC, respectively.

4 3 3 1,2

Let $P(EF) = 0.1$, $P(MC) = 0.2$,

$P(CF | \sim EF, \sim MC) = 0.0$, $P(CF | \sim EF, MC) = 0.5$,

$P(CF | EF, \sim MC) = 1.0$, and $P(CF | EF, MC) = 1.0$.

Draw a Bayesian Network (with conditional probability table) for this problem and Compute $P(EF | CF)$.

14. a)	Explain the case-based reasoning (CBR) with an example.	4	1	4	1,2																																																
b)	Consider the Height and Age attributes of 10 persons given below. Find the weight of the 11th person by using Simple KNN with $k=3$ and $k=5$.	4	3	4	1,2																																																
<table border="1" style="margin-left: auto; margin-right: auto;"> <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>						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	?
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15. a)	Explain the Convolution Neural Network with a diagram.	4	2	5	1,2																																																
b)	Describe the application of genetic program to solve stacking the blocks problem.	4	3	5	1,2																																																
16. a)	Explain the issues need to be addressed in machine learning.	4	2	1	1,2																																																
b)	What is Perceptron? Derive the equation for weight updation in the perceptron learning algorithm.	4	1	2	1,2																																																
17.	Answer any <i>two</i> of the following:																																																				
a)	Explain how Mistake bound is computed in i. Find-S algorithm ii. Weighted Majority algorithm	4	2	3	1,2																																																
b)	Describe the Radial Basis Function (RBF) network with diagram.	4	2	4	1,2																																																
c)	Explain Genetic algorithm with an example.	4	2	5	1,2																																																

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	38%
iii)	Blooms Taxonomy Level – 3 & 4	42%
