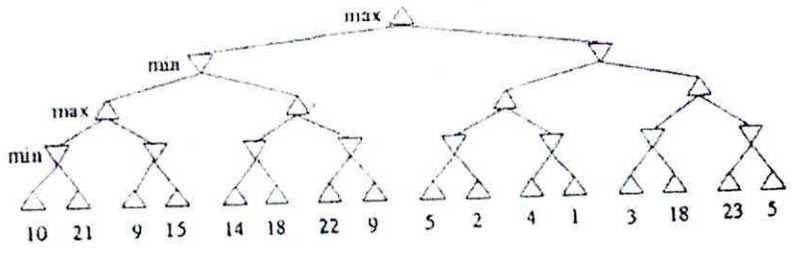
09/08/23

Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri(West),Mumbai 400058-India
(An Autonomous Institute Affiliated to University of Mumbai

Grade Improvement Examination
August 2023

Max. Marks: 100 | Duration: 3 hrs
Class: TEIT/TECOMP | Semester: V
Course Code: | Branch: IT/COMP
Course: Artificial Intelligence and Machine Learning

Instructions:
(1) All Questions are Compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Question No.		Max. Mark	CO	BL
Q1(a)	i) For each of the following activities, give PEAS description of the task environment and characterize it in terms of properties of task environment. 1- Knitting a Sweater 2- Performing High Jump 3- Practicing tennis against wall ii) Describe various properties of task environments	03 07	1	2
Q1 (b)	Describe Learning agent model with suitable diagram.	10	2	4
Q2 (b)	Find the most cost-effective path to reach the final state from initial state using A* Algorithm. Consider g(n) = Depth of node and h(n) = Number of misplaced tiles  Initial State Final State	10	2	6
Q3(a)	Suggest the optimal decision for the given game tree using Alpha-beta Pruning. At each point, show the range of possible values for each node i.e. α, β, and pruned nodes along with pruning criteria.  	10		

Q3 (b)	Represent the following sentences in first-order logic, using a consistent vocabulary (which you must define): a. Some students took French in spring 2001. b. Every student who takes French passes it. c. Only one student took Greek in spring 2001. d. The best score in Greek is always higher than the best score in French. e. Every person who buys a policy is smart. f. No person buys an expensive policy. **OR** For the following English statements choose the correct FOL statements. And give Justification for the incorrect statement stating the reason. **a. Paris and Marseilles are both in France.** (i) In(Paris ∧ Marseilles,France). (ii) In(Paris,France) ∧ In(Marseilles,France). (iii) In(Paris,France) ∨ In(Marseilles,France). **b. There is a country that borders both Iraq and Pakistan.** (i) ∃ c Country(c) ∧ Border (c,Iraq) ∧ Border (c,Pakistan). (ii) ∃ c Country(c) ⇒ [Border (c,Iraq) ∧ Border (c,Pakistan)]. (iii) [∃ c Country(c)] ⇒ [Border (c,Iraq) ∧ Border (c,Pakistan)]. (iv) ∃ c Border (Country(c),Iraq ∧ Pakistan). **c. All countries that border Ecuador are in South America.** (i) ∀ c Country(c) ∧ Border (c,Ecuador) ⇒ In(c, SouthAmerica). (ii) ∀ c Country(c) ⇒ [Border (c,Ecuador) ⇒ In(c, SouthAmerica)]. (iii) ∀ c [Country(c) ⇒ Border (c,Ecuador)] ⇒ In(c, SouthAmerica). (iv) ∀ c Country(c) ∧ Border (c,Ecuador) ∧ In(c, SouthAmerica). **d. No region in South America borders any region in Europe.** (i) ¬[∃ c,d In(c, SouthAmerica) ∧ In(d,Europe) ∧ Borders(c,d)]. (ii) ∀ c,d [In(c, SouthAmerica) ∧ In(d,Europe)] ⇒ ¬Borders(c,d)].	10	3	1

(iii) ¬∀ c In(c, SouthAmerica) ⇒ ∃ d In(d,Europe) ∧ ¬Borders(c,d).
(iv) ∀ c In(c, SouthAmerica) ⇒ ∀ d In(d,Europe) ⇒ ¬Borders(c,d).

e. No two adjacent countries have the same map color.
(i) ∀ x,y ¬Country(x) ∨ ¬Country(y) ∨ ¬Borders(x,y) ∨¬(MapColor (x) = MapColor (y)).
(ii) ∀ x,y (Country(x) ∧ Country(y) ∧ Borders (x,y) ∧ ¬(x = y)) ⇒ ¬(MapColor (x) = MapColor (y)).
(iii) ∀ x,y Country(x) ∧ Country(y) ∧ Borders(x,y) ∧ ¬(MapColor (x) = MapColor (y)).
(iv) ∀ x,y (Country(x) ∧ Country(y) ∧ Borders (x,y)) ⇒ MapColor (x 6= y).

Q4(a) — 10 — 4 — 3

Give a sequence of S and G boundary sets computed by applying the CANDIDATE-ELIMINATION algorithm if it is given the sequence of examples in the order in which they appear on the table.

STATUS	FLOOR	DEPT.	OFFICE SIZE	RECYCLING BIN?
Faculty	four	cs	medium	yes
Faculty	four	ee	medium	yes
Student	four	cs	small	no
Faculty	five	cs	medium	yes

Q4 (b) — 10 — 4 — 3

Apply K means algorithm on given data set for K=3,

use C1(2),C2(6) and C3(15) as initial cluster centers.

Data :{2,3,6,7,8,9,12,15,18,22}

5(a)	Apply Naive Bayesian Classification algorithm on a given dataset. Sugar is the target label. The target label has two possibilities 0 and 1. 0 means the diabetic patient has no sugar and 1 means the diabetic patient has sugar (1- He is a diabetic patient). Predict the response for the person with BMI=43.6, Age=40 .	10	5	3

BMI	Age	Sugar
33.6	50	1
26.6	30	0
23.4	40	0
43.1	67	0
35.3	23	1
35.9	67	1
36.7	45	1
25.7	46	0
23.3	29	0
31	56	1

<table>
<tr>
<td>Q5(b)</td>
<td>Obtain the equation of regression line for the following data. Calculate value of correlation coefficient. Estimate glucose level for age=55 using the regression line equation.

<table>
<tr><td>Age (X)</td><td>43</td><td>21</td><td>25</td><td>42</td><td>57</td><td>59</td></tr>
<tr><td>Glucose Level(Y)</td><td>99</td><td>65</td><td>79</td><td>75</td><td>87</td><td>81</td></tr>
</table>
</td>
<td>10</td><td>5</td><td>5</td>
</tr>
<tr>
<td>Q5(c)</td>
<td>Compare Bias and Variance with suitable examples.

OR

How Support Vector Machine are used as Classification Model.</td>
<td>10</td><td>4</td><td>4</td>
</tr>
</table>

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