16CS5A3

USN

R. V. COLLEGE OF ENGINEERING

Autonomous Institution affiliated to VTU
V Semester B. E. Examinations Nov/Dec-18

Computer Science and Engineering

ARTIFICIAL INTELLIGENCE (ELECTIVE)

Time: 03 Hours ***Maximum Marks: 100***

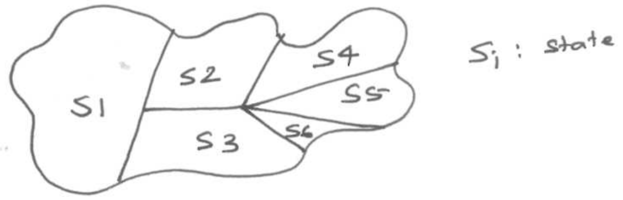
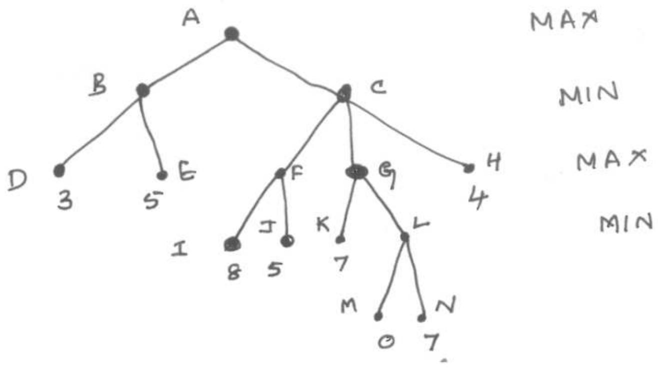
Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B.In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6

PART-A

<table>
<tr><td>1</td><td>1.1</td><td>An agent is an entity which interacts with environment through _______ and _______.</td><td>02</td></tr>
<tr><td></td><td>1.2</td><td>Define a rational agent.</td><td>01</td></tr>
<tr><td></td><td>1.3</td><td>Give the purpose of utility function.</td><td>01</td></tr>
<tr><td></td><td>1.4</td><td>Differentiate uniformed search and informed search.</td><td>01</td></tr>
<tr><td></td><td>1.5</td><td>What is admissible heuristic?</td><td>01</td></tr>
<tr><td></td><td>1.6</td><td>For a given 8 puzzle actions, construct three relaxed problems.
“A tile can move from square A to square B if A is horizontally or vertically adjacent to B and B is blank”.</td><td>01</td></tr>
<tr><td></td><td>1.7</td><td>Define constraint satisfaction problem.</td><td>01</td></tr>
<tr><td></td><td>1.8</td><td>In a competitive environment, in which the agents’ goals are conflicting, gives rise to _______ search problems.</td><td>01</td></tr>
<tr><td></td><td>1.9</td><td>Translate the following into First Order logic
• Every bag contains at least one coin
• Tom’s sister knows Mary’s brother.</td><td>02</td></tr>
<tr><td></td><td>1.10</td><td>Prove using first order logic, the following sentence is ambiguous, “Everyone loves someone”.</td><td>02</td></tr>
<tr><td></td><td>1.11</td><td>Give the meaning of logical entailment and provide an example.</td><td>01</td></tr>
<tr><td></td><td>1.12</td><td>Differentiate supervised and unsupervised learning.</td><td>02</td></tr>
<tr><td></td><td>1.13</td><td>Given a collection of examples of f, return a function h that approximates f, the h is called _________.</td><td>01</td></tr>
<tr><td></td><td>1.14</td><td>Given the following full joint distribution
<table>
<tr><td></td><td colspan="2">$Toothache$</td><td colspan="2">$\neg tootheache$</td></tr>
<tr><td></td><td>$catch$</td><td>$\neg catch$</td><td>$catch$</td><td>$\neg catch$</td></tr>
<tr><td>$Cavity$</td><td>0.108</td><td>0.012</td><td>0.072</td><td>0.008</td></tr>
<tr><td>$\neg Cavity$</td><td>0.016</td><td>0.064</td><td>0.144</td><td>0.576</td></tr>
</table>
Find:
i) $P\ (cavity\ /\ toothache)$
ii) $P(\neg cavity\ /\ toothache)$</td><td>02</td></tr>
<tr><td></td><td>1.15</td><td>Give the conditional independence of two variables X and Y given variable Z.</td><td>01</td></tr>
</table>

PART-B

2	a	"Buying a week's worth of groceries on the web is an *AI* problem". Examine the truthness of this statement.	06
	b	Compare with necessary block diagrams and functions a model-based, reflex agent with a model-based, goal-based agent.	06
	c	Compare depth – first search with depth – limited search with respect to principle of working and complexities.	04
3	a	For 8 – puzzle problem, define any two admissible heuristics. Analyze the effect of heuristic accuracy on performance.	06
	b	Given a map with principal states and territories. Explain how the coloring of map can be viewed as a constraint satisfaction problem. The goal is to assign colors to each region so that no neighboring regions have the same color. The color set has { red, green, blue}.  	06
	c	Write a simple backtracking algorithm for constraint satisfaction problems.	04
		OR	
4	a	Write various components of a game problem, when it is formally defined as a search problem.	04
	b	Perform both left-to-right and right-to-left prune on the given maximum game time.  	04
	c	Discuss the working of online search agents which uses depth – first exploration.	08
5	a	Show that the following sentence is a tantology using rules $[p \wedge (p \rightarrow q)] \rightarrow q$	06

b	Give Modus Ponens rule, and AND – elimination rule. If the knowledge base contains following rules for Wumpus world problem. $R_1: \neg P_{1,1}; No\ pit\ in\ [1,1]$ $R_2: B_{1,1} \Leftrightarrow (P_{1,2} \vee P_{2,1})$; A square is breezy if there is a pit in neighboring square $R_3: B_{2,1} \Leftrightarrow (P_{1,1} \vee P_{2,2} \vee P_{3,1})$ $R_4: \neg B_{1,1}$ $R_5: B_{2,1}$ Using logical-equivalence, Modus Ponens, And-elimination and De Morgan's rule, prove that there is no pit in $[1,2]$ i.e., $\neg P_{1,2}$.	06
c	Relate proportional versus first order influence and give an illustration.	04
	OR	
6 a	Discuss the following with suitable examples: i) Generalized Modus Ponens ii) Unification.	06
b	Write forward-chaining algorithm , illustrate the working of forward chaining to prove $American\ (x) \wedge Weapon(y) \wedge Sells\ (x,y,z) \wedge Hostile\ (z) \Rightarrow Criminal\ (x)$	06
c	How the working of backward – chaining differs as compared to forward-chaining.	04
7 a	For a problem of whether to wait for a table at a restaurant, we have the following attributes. • Alternate: option of restaurant • Bar: attached/not • Fir/Sat: opens on these days • Hungry: Are you? • Patrons: No. of people inside (none, Some, Full) • Price: \$, \$\$, \$\$\$ • Raining: is it raining outside? • Reservation: whether we have reserved? • Type: French, Italian, Thai • Wait Estimate: $0 - 10\ min, 10 - 30\ min, 30 - 60\ min, > 60\ min$ Construct a decision tree for an example, we will wait for a table with patrons = Full and Wait estimate = $0 - 10\ mins$	06
b	Discuss the working of inductive learning.	06
c	Give suitable applications for the following: i) Supervised learning ii) Unsupervised learning iii) Reinforcements learning.	04

8	a	Explain the working of decision theoretic agents.	04
	b	Consider a Bayesian network given below  $P(Alarm\ 1) = 0.1, P(Alarm\ 2) = 0.2$ $P(Burglary/Alarm1, Alarm2) = 0.8$ $P(Burglary/Alarm1, \neg Alarm2) = 0.7$ $P(Burglary/\neg Alarm1, Alarm2) = 0.6$ $P(Burglary/\neg Alamr1, \neg Almarm2) = 0.5$ Find $P(Alarm2/Burglary, Alarm1)$.	06
	c	Define and give suitable examples for the following: i) Deterministic nodes ii) Noisy $-OR$ iii) Discretization.	06