Day

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination Semester: Fall 2019
Course Code: CSE 412
Course Title: Artificial Intelligence
Course Teacher: ALL

Time: 2 hours Full Marks: 40

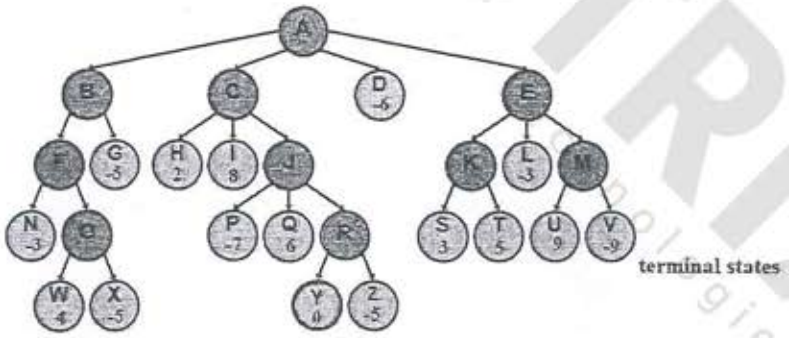
Answer any *four* (including **Question 5**) of the following *five* questions. Figures in the right-hand margin indicate full marks.

1. (a) What is an expert system? Write some application areas of expert systems. 2
   (b) Describe the different components of an expert system in detail. 7

2. (a) Let us consider an evaluation function $f(n)$ for Tic-Tac-Toe: 4
   $f(n)$ = [# of 3-lengths open for me] − [# of 3-lengths open for you],
   where a 3-length is a complete row, column, or diagonal.
   Now, calculate the values of evaluation function of the following nodes, i.e. states.

   i) ii) iii) iv)

   (b) Perform `greedy search` and `minimax search` on the following game tree separately. 2+3



3. (a) What do you understand by knowledge base? Describe in detail. 4
   (b) Define entailment. Then solve the following problem: 5
   Given,

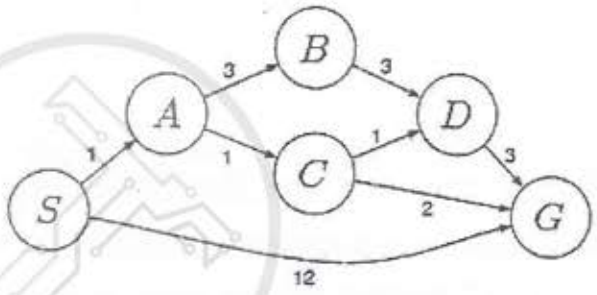
   $KB = X \rightarrow Y, \neg Y \vee X, \neg Y \vee Z, Z \rightarrow Y.$

   $\alpha = X \leftrightarrow Y \wedge Y \leftrightarrow Z$

   Find out whether $KB \models \alpha$.

4. (a) What do you understand by local search? Discuss the problems and their solutions of hill-climbing search.

(b) Perform A* search on the following scenario, where start node is S and goal node is G. 4



State, n	Heuristic function, $h(n)$
S	11
A	2
B	5
C	1
D	2
G	0

5. Write the answer to the following questions in a single sentence.

(a) Which search usually runs out of space before running out of time? 1

(b) Which search is a variation of hill-climbing search that moves downhill? 1

(c) Why Manhattan distance ≥ Euclidean distance? 1

(d) What can be the maximum number of nonattacking pairs of queens in 100-queens problem?

(e) How many features does Deep Blue have in its evaluation function? 1

(f) Why is direct minimax algorithm impractical in practice? 1

(g) What is the problem for stopping at any ply in minimax search? 1

(h) What are logics? 1

(i) Write the operator precedence in propositional logic. 1

(j) What is a collection of software packages and tools used to develop expert systems? 1

(k) What is the difference between backward chaining and forward chaining? 1

(l) Which knowledge cannot be refined by an expert system? 1

(m) What are the models of KB? 1