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B.Sc. Engg. /HD CSE 6th Semester

26 August 2019 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **SUMMER SEMESTER, 2018-2019**

DURATION: 1 Hour 30 Minutes **FULL MARKS: 75**

CSE 4617: Artificial Intelligence

Programmable calculators are not allowed. Do not write anything on the question paper.

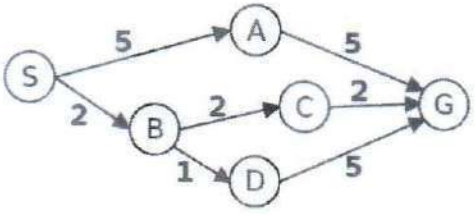
There are **4 (four)** questions. Answer any **3 (three)** of them.

Figures in the right margin indicate marks.

1. a) Briefly describe the Turing Test for artificial intelligence. Distinguish between programming with and without AI. 7

   b) Why rationality is different from omniscient? Explain the following properties of environment in respect to a chess game with a clock: observability, determinism, episodic, static, and discrete. 8

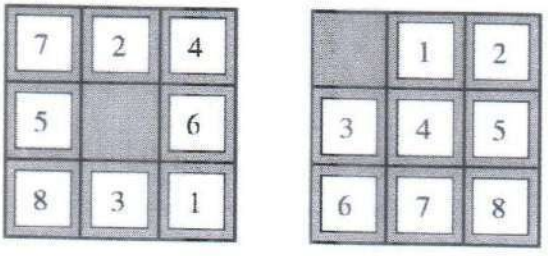
   c) What is uninformed search? Stepwise show the uniform cost search applied over the following weighted graph (where S and G represent start and goal nodes respectively). Does this search guarantee optimal and complete solution? Justify your answer. 10



2. a) Considering the following initial and goal states of an 8-puzzle problem: 8

   i. Write two admissible heuristic functions that can be considered here. Which heuristic is better than the other, and why?

   ii. Perform a greedy best first (state space) search to find the goal state. Stop the search as soon as the search expands a state at level three. Use the Manhattan distance (not including the blank) as a heuristic to guide the search.

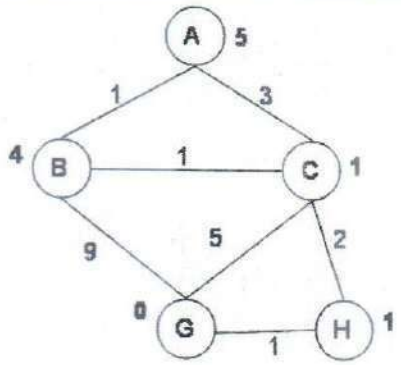


Start State Goal State

   b) How SMA* search can overcome the drawbacks of recursive best-first search (RBFS)? Explain with necessary examples. 8

   c) Consider the graph shown below where the numbers on the links are link costs and the numbers next to the states are heuristic estimates. Note that the arcs are undirected. Let A be the start 9

state and G be the goal state. Simulate A* search with a strict expanded list on this graph. Explain, whether the given heuristic is admissible and/or consistent.



3. a) "A local search can solve a n-queens problem (or get stuck in a local minima) in almost constant time for arbitrary n with high probability in solving a CSP problem" – Justify the statement by performing a local search of a 4-queens [Q_1, Q_2, Q_3, Q_4] problem starting from the following initial configuration [1, 2, 1, 2], as shown in the following figure. Here, the queens Q_1, Q_2, Q_3, and Q_4 are dedicated to the columns 1, 2, 3, and 4 respectively, and one single (usually the most aggressive) queen can be moved at a time. 8

b) How can you overcome the difficulties caused by ridges in hill climbing search? Briefly explain the working principle of simulated annealing process. 8

c) How a local search can be applied to a travelling salesman problem using two-opt neighbourhood? Explain with an example. 9

4. a) What is arithmetic crossover? Why is it important to have mutation operator in a genetic algorithms (GA)? 6

b) What is higher order constraint in a constraint satisfaction problem (CSP)? Explain, which variable should be assigned next, and in what order should its values be tried for improving the backtracking speed in solving the following cryptarithmetic problem, where each letter of the problem has to be substituted with a digit within 0 to 9, with no repeating values. 12

$$\begin{array}{r} \text{T W O} \\ +\ \text{T W O} \\ \hline \text{F O U R} \end{array}$$

c) How can you detect inevitable failure early using Arc Consistency for improving backtracking efficiency? Explain with a relevant example. 7