National University

of Computer & Emerging Sciences Peshawar Campus

Student Name: _____ Roll No: _____

Program: CS-18 A&B
Semester: SPRING – 2021
Time Allowed: 20:00 minutes
Course: Artificial Intelligence (CS 401 & 461)

Examination: MOCK
Total Marks: **60** Weightage: **30**
Date: 20/05/2021
Instructor: Dr. Hafeez ur Rehman

NOTE: Attempt all questions. Distribute your time according to question's overall weightage.

Time Allowed: 25 minutes

Submissions after 25 minutes will not be accepted.

Question # 02: **[Marks: 5 x 5]**

Give short answers (in no more than **two sentences**) of the following:

1. Given two *admissible* heuristics *h1* and *h2* with fluctuating cost estimates. How will you use them for your informed search algorithm and why?

In the given question, since, h1 and h2 are admissible therefore, there cost estimate will always be more than actual costs. Recall the notion of heuristic dominance i.e., if $h_2(n) \geq h_1(n)$ for all n (both admissible) then h_2 **dominates** h_1. This means the good heuristic is the one with higher cost estimate. Now, in the given question, since the heuristic costs fluctuate for different states, therefore, the best way to use both would be to select the max cost among the two i.e., max(*h1*,*h2*).

2. What are the three reasons for Hill Climbing algorithm to be incomplete in a larger search space?

The three reasons for Hill Climbing algorithms to be incomplete are Local Maxima, Ridges, and Plateau regions in the state space.

3. What will be the size of 7x7 (48-puzzle) puzzle's searchable state space?

Recall the explanation I gave you for a 3x3 tile, 8-puzzle. Similarly, the size of the state space for the above puzzle will be: 49!/2

4. Explain effective branching factor? Why we use it?

The effective branching factor is the branching factor that a uniform tree of depth d would have in order to contain N+1 nodes. It is used to provide a good guide to the heuristic's overall usefulness.

5. In simulated annealing, what will happen (explain using values of $p = e^{\Delta E/T}$) if we run the algorithm at a cold place say North Pole (where temperature is -50 C) and Sahara desert where temperature is +50 C?

Nothing. The temperature T is a parameter of the algorithm, running it anywhere, will not affect it. It was just a common sense question. 😉