National University

Of Computer & Emerging Sciences Faisalabad-Chiniot Campus

AI 2002 Artificial Intelligence Course Instructor Ms. Mahzaib Younas		
Time allowed = 25 min	Quiz 1	Total Marks = 20

BCS Section A

Roll No	Name	Signature

Question No 01: Give the name of the algorithm that results from each of the following special cases: **[1.5 x 4 = 6]**

1. **Simulated annealing with a temperature T = 0 also behaves identically to a hill climbing search.**
   Simulated annealing with T = 0 at all times: ignoring the fact that the termination step would be triggered immediately, the search would be identical to first-choice hill climbing because every downward successor would be rejected with probability 1.

2. **Local beam search with one initial state and no limit on the number of states retained.**
   Local beam search with one initial state and no limit on the number of states retained, resembles breadth-first search in that it adds one complete layer of nodes before adding the next layer. Starting from one state, the algorithm would be essentially identical to breadth-first search except that each layer is generated all at once.

3. **Simulated annealing with T = ∞ at all times**
   Simulated annealing with T = ∞ at all times is a random-walk search: it always accepts a new state.

4. **Local beam search with k = 1.**
   Local beam search with k=1 is hill-Climbing search

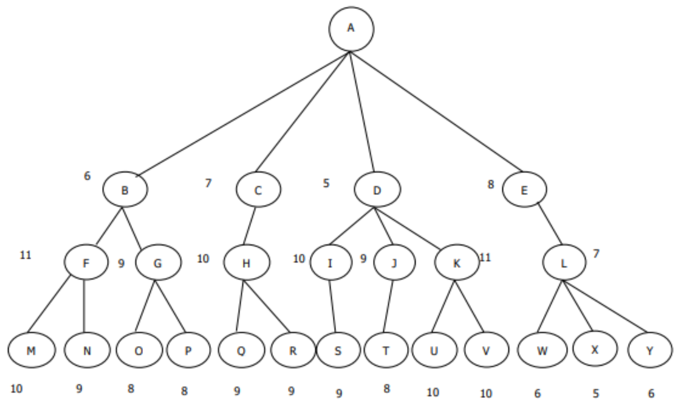
Question No 02: Simulated annealing will find a global optimum with probability approaching 1 if you lower T slowly enough. Please explain what simulated annealing will do in each of the following cases **[2 x 2 = 3]**

1. **What happens if you lower T very quickly?**
   You will very likely get stuck in a local maximum

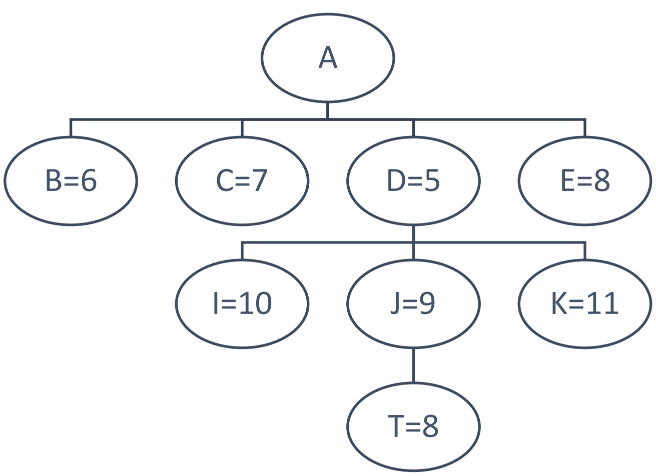
2. What happens if you never lower T?
   You will always have a nonzero probability of going downhill. Therefore, even if you reach the global maximum, you won't stay there

Question No 03: Consider the following tree as part of a search space. The numbers assigned to each node indicates the estimated distance to the goal. Draw the search tree and write the order of expansion of the nodes for the following search methods **[4 x 2 = 8]**

a) Hill climbing
b) Beam search with width=2



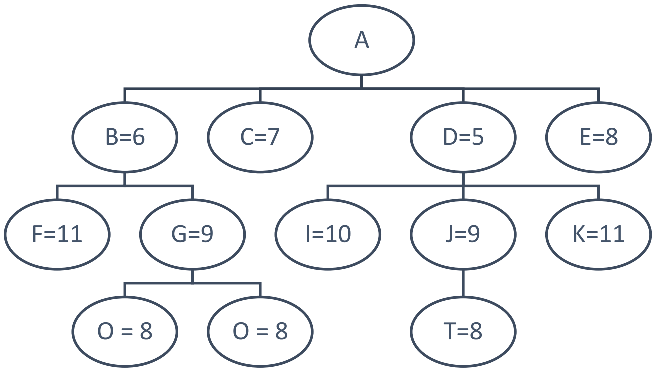
A. Tree of simple Hill Climb



Node List	
Visited node	**Children**
A	**B,C,D,E**
D	**I,J,K**
J	**T**

PATH: A, D, J

B. Tree and list of Local Beam with k = 2



Node List	
Node	**Children**
A	**B, C, D, E**
B, D	**F, G, I, J, K**
G, J	**O P T**

PATH: A,B,D,G,J

Which one Provide Better/Optimal Solution? Reason [2]

hill climbing chooses the first neighbor that it finds to be better than the current state, Local Beam checks more neighbors and compares them with the heuristic function. This makes it possible to choose the best one among several states