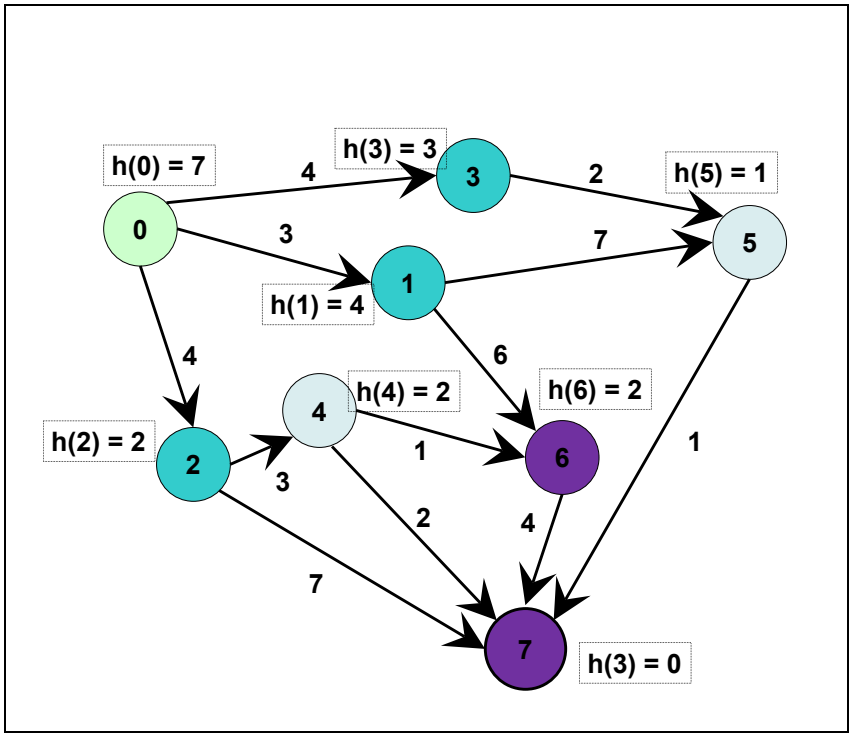
1. **Search (4 parts, 50 points total).**



a) **(25 points) Uninformed and Heuristic Search.** Simulate the behavior of Breadth First Search and A* search for the above graph with start node **0** and goal node **7**. Show the evolution of the search **and the path found**, with costs. For each search, *indicate whether the solution is optimal.* Break ties in ascending order of node number (lower-numbered nodes are expanded first in case of a tie).

(10 points) Breadth-First Search:

Path found: 0 -> 2 -> 7

Optimal path cost in this case? Y / N : Yes

(15 points) A* search:

Path found: 0 -> 3 -> 5-> 7

Optimal path cost in this case? Y / N : yes

b) **(5 points) Admissibility.** Is the heuristic above admissible? Why or why not?

The above heuristic is admissible.
Reason : heuristic is admissible if $0 <= h(n) <= h^*(n)$
here, $h(3) < h(0->3->5->7)$

c) **(10 points) Consistency.** Is the heuristic consistent? Why or why not? (Use an illustration if it helps.) Is it possible for a heuristic to be admissible but not consistent? Why or why not?

The heuristic is consistent.
Reason : Heuristic is consistent if $h(n) <= c(n, n^*) + h^*(n)$ (n* is next goal). in our case this condition holds true for all h(n).
hence this heuristic is consistent.

(10 points) Heuristic Quality and Efficiency. Is the heuristic worse or better than h = 0 ? Why? (What does this have to do with the number of nodes expanded?)

heuristic is better than h = 0. In this case, our best first directly lead to the goal. we have considered dequeue goal.
If we just keep expanding number of nodes but we don't get optimal solution then we can say that heuristic is not efficient because in that case, we will be using badly guided DFS.