Assignment # 1

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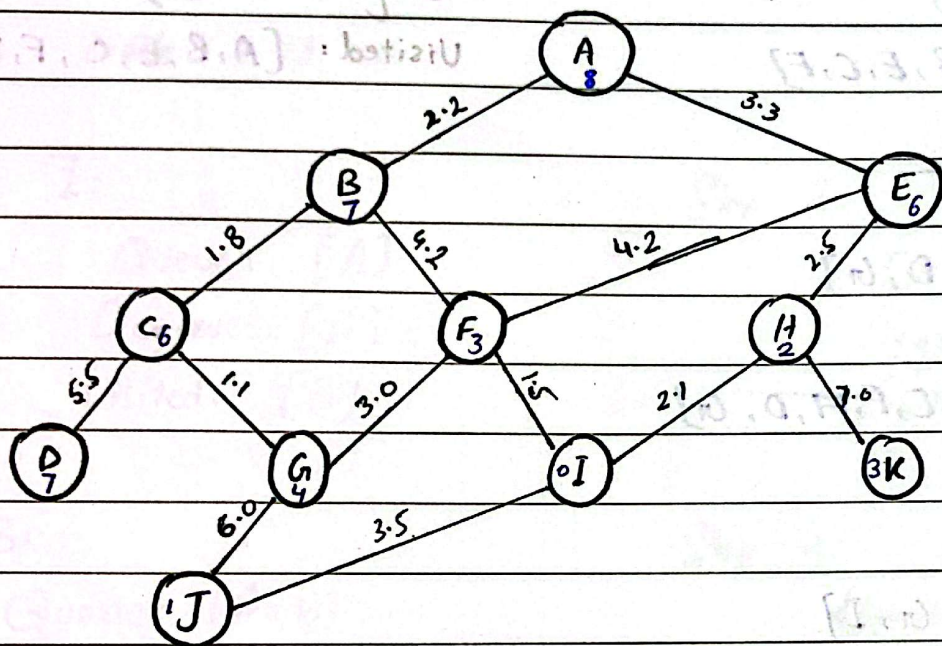
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Coarse : Artificial Intelligence.

A 8

2.2   3.3

B 7   E 6

1.8   4.2   4.2   2.5

C 6   F 3   H 2

5.5   1.1   3.0   2.1   7.0

D 7   G 4   I 0   3 K

6.0   3.5

J

Breadth First Search

Start Node = A
Goal Node = I

Step 1:
Queue: [A]
Dequeue: [A]
Visited: [A]

Step 2:
Queue: [B, E]
Dequeue: [B]
Visited: [A, B, E]

Step 3:
 Queue: [E, C, F]
 Dequeue: [E]
 Visited: [A, B, E, C, F]

Step 4:
 Queue: [C, F, H]
 Dequeue: [C]
 Visited: [A, B, E, C, F, H]

Step 5:
 Queue: [F, H, D, G]
 Dequeue: [F]
 Visited: [A, B, E, C, F, H, D, G]

Step 6:
 Queue: [H, D, G, I]
 Dequeue: [H]
 Visited: [A, B, E, C, F, H, D, G, I]

Step 7:
 Queue: [D, G, I]
 Dequeue: [D], [G]
 Visited: [A, B, E, C, F, H, D, G, I]

Step 8: Queue: [I]
 Dequeue: [I]
 Visited: [A, B, E, C, F, H, D, G, I]

BFS   Path:

[A → B → E → C → F → H → D → G → I]

DFS :

Start Node = A , Goal = I

Step 1 :

stack = [A]
visited = { }
pop A , visited A
visited = { }
push neighbour (B, E)
stack = [E, B]

Step 2 :

pop B
visited = { A, B }
neighbour of B (C, F, A)
stack = [E, F, C]

Step 3 :

pop C
visited = { A, B, C }
neighbour of C (D, G, B)
stack = [E, F, G, D]

Step 4:
  pop D
      visited = { A, B, C, D }
  D has no neighbour → nothing added

      stack = [E, F, G]

Step 5:
      pop G
  visited = { A, B, C, D, G }
  neighbour of G (J, F, C)

      stack = [E, F, J]

Step 6:
      pop J
  visited = { A, B, C, D, G, J }
  neighbour of J (I, G)

      stack = [E, F, I]

Step 7:
  pop I
      visited = { A, B, C, D, G, J, I }

      Goal found (I)
  DFS path = A → B → C → D → G → J → I

Greedy Search

Start Node : A(8)
Goal Node: I(0)

Step 1:
    Opened list: [A(8),]
    Closed list: (A)

Step 2:
    Opened list: [B(7), E(6)]
    Close list : [A, E]

Step 3:
    Open list: [F(3), H (2)]
    Close list: [A, E, H]

Step 4:
    Open list: [I(0), K(3)]
    Close list: [A, E, H, I]

Total Cost: 7.9

Greedy Path:

$$A \rightarrow E \rightarrow H \rightarrow I$$

A^* Search

Start Node = A(8)

Goal Node = I(0)

Step 1:

$A \to B = 2.2 + 7 = 9.2$

$A \to E = 3.3 + 6 = 9.3$

open list = [B(9.2), E(9.3)]

close list = [A]

Step 2:

B(9.2) chosen

$A-B-C = (2.2+1.8) + 6 = 10.0$

$A-B-F = (2.2+4.2) + 3 = 9.4$

Open list = [E(9.3), C(10.0), F(9.4)]

Close list = [A, B]

Step 3:

E(9.4) chosen

$A-E-H = (3.3 + 2.5) + 2 = 7.8$

Open list = [C(10), F(9.4), H(7.8)]

Close list = [A, B, E]

Step 4:

H(7.8) choose

$A-E-H-I = (3.3 + 2.5 + 2.1) + 0 = 7.9$

$A-E-H-K = (3.3 + 2.5 + 7.0) + 3 = 15.8$

Open list = [I(10.0), F(9.4), I(7.9), K(15.8)]

Close list = [A, B, E, H]

Total Cost = 7.9

A^* Path =

$A \to E \to H \to I$