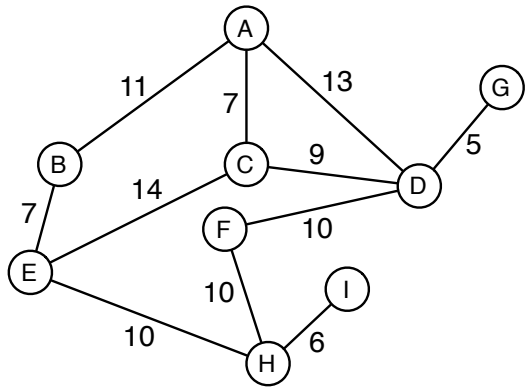
4. (a) Consider the state space shown below, in which the arcs represent the legal successors of a node. Arcs are bi-directional and are labelled with the cost of performing the corresponding action. The start state is **A** and the goal is **I**. Suppose that you are given a heuristic, h_1, defined by the following table.

Node	A	B	C	D	E	F	G	H	I
h_1	34	23	30	39	15	16	44	6	0



For each of the following search methods, show the resulting search tree, list the sequence in which nodes are removed from the queue, and state how many nodes are expanded. You should also state the route found and its associated cost. In the case of ties between nodes, assume that nodes are inserted into the queue in alphabetical order. When expanding a node, do not generate its parent.

i. Uniform cost search. [5]

ii. Greedy best-first search. [5]

iii. A* search. [5]

(b) Now suppose that you are given another heuristic, h_2, defined by the following table.

Node	A	B	C	D	E	F	G	H	I
h_1	34	28	24	38	17	16	85	7	0

i. Use A* to determine a route from **A** to **I** using h_2 as the heuristic, showing your search tree and giving the sequence of nodes expanded. State the route found and its associated cost. [4]

ii. For the above problem, which is the better heuristic, h_1 or h_2, and why? [2]

(c) Formally prove that A* is an optimal search strategy for locally finite graphs. [4]