Introduction to AI - Exercise I

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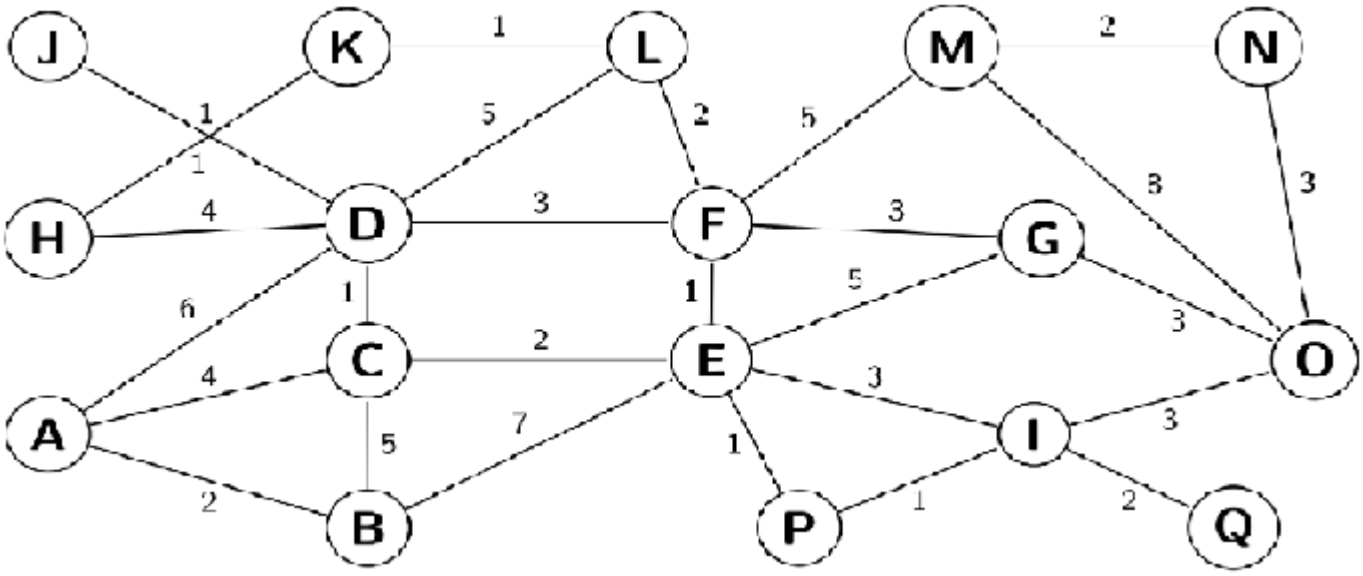
1 Graph



2 Question One

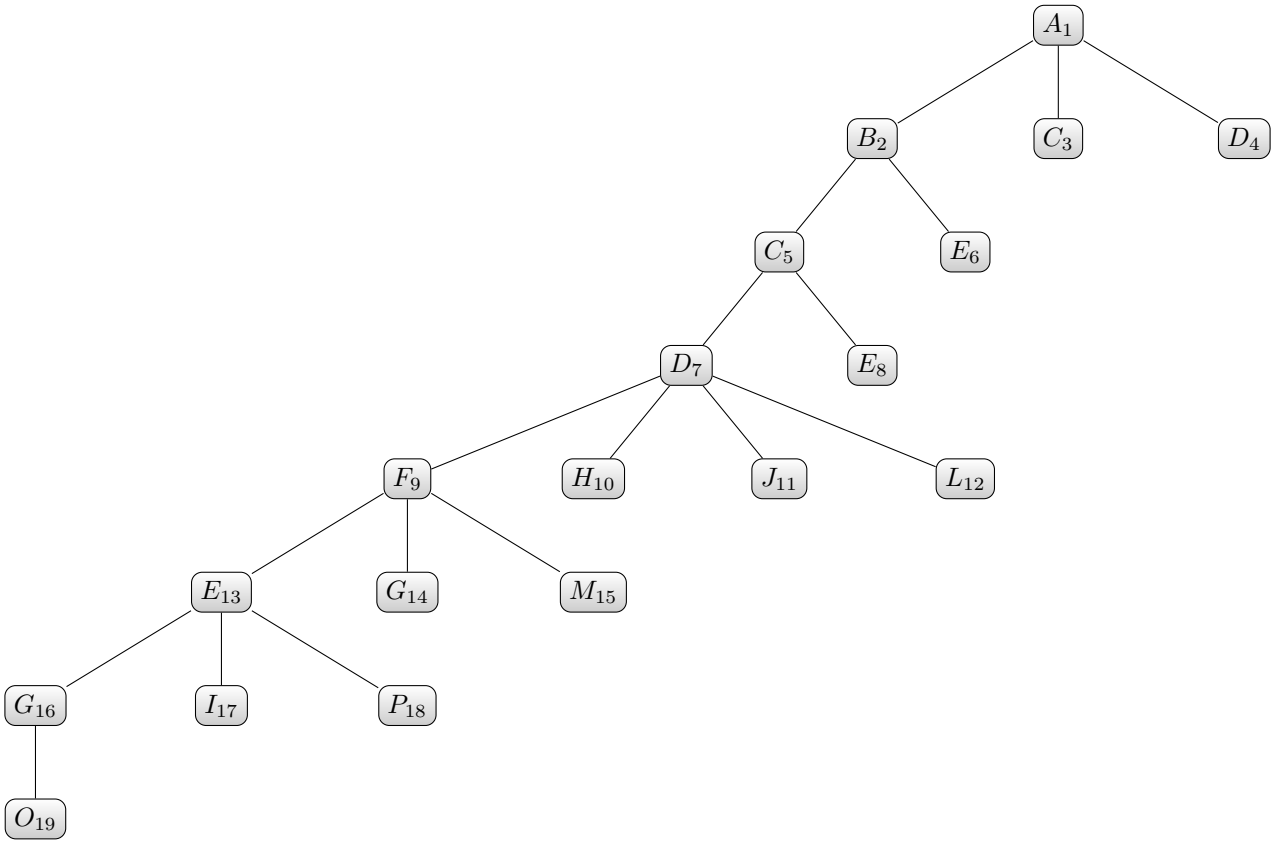
2.1 Brief

For this exercise ignore the path costs. Perform Depth-First-Search to find a path from A to O. Assume that nodes are expanded in alphabetic order. Write down carefully the values in your data structures Explored and Frontier as well as the search tree. [30% − 30 *marks*]

2.2 Answer - Data Structures

Frontier	**Explored**
$[A_1]$	[ ]
$[B_2, C_3, D_4]$	$[A_1]$
$[C_5, E_6, C_3, D_4]$	$[A_1, B_2]$
$[D_7, E_8, E_6, C_3, D_4]$	$[A_1, B_2, C_5]$
$[F_9, H_{10}, J_{11}, L_{12}, E_8, E_6, C_3, D_4]$	$[A_1, B_2, C_5, D_7]$
$[E_{13}, G_{14}, M_{15}, H_{10}, J_{11}, L_{12}, E_8, E_6, C_3, D_4]$	$[A_1, B_2, C_5, D_7, F_9]$
$[G_{16}, I_{17}, P_{18}, G_{14}, M_{15}, H_{10}, J_{11}, L_{12}, E_8, E_6, C_3, D_4]$	$[A_1, B_2, C_5, D_7, F_9, E_{13}]$
$[O_{18}, I_{17}, P_{18}, G_{14}, M_{15}, H_{10}, J_{11}, L_{12}, E_8, E_6, C_3, D_4]$	$[A_1, B_2, C_5, D_7, F_9, E_{13}, G_{16}]$

2.3 Answer - Tree



2.4 Answer - Sequence

The following sequence is the solution to reach the goal state, $\{O\}$.

$$[A_1, B_2, C_5, D_7, F_9, E_{13}, G_{16}, O_{19}]$$

3 Question Two

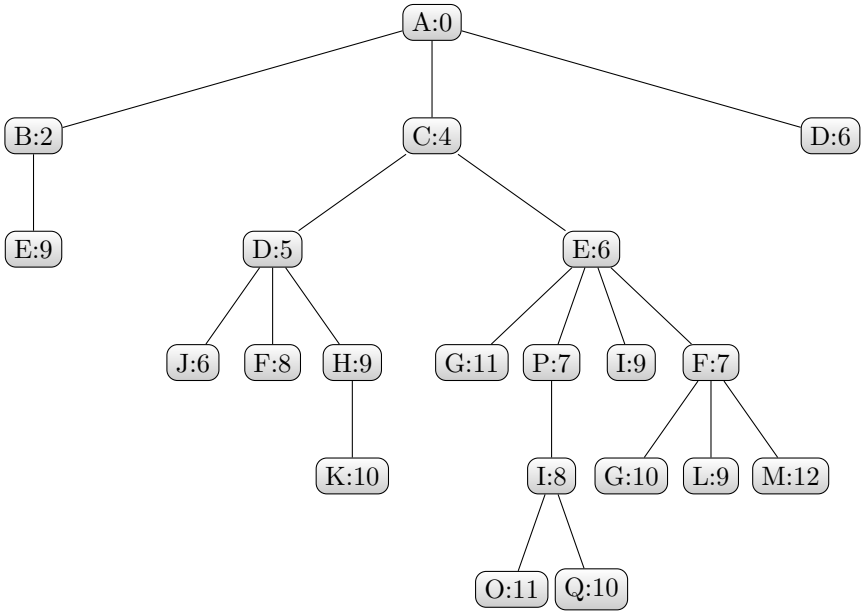
3.1 Brief

Perform Uniform Cost Search to find a path from A to O. Again assume that nodes are expanded in alphabetic order. Write down carefully the values in your data structures Explored and Frontier as well as the search tree [30% - 30 marks]

3.2 Answer -Data Structures

Frontier	**Explored**
[A:0]	[ ]
[B:2, C:4, D:6]	[A:0]
[C:4, D:6, E:9]	[A:0, B:2]
[D:5, E:6]	[A:0, B:2, C:4]
[E:6, J:6, F:8, H:9]	[A:0, B:2, C:4, D:5]
[J:6, F:7, P:7, H:9, I:9, G:11]	[A:0 B:2, C:4, D:5, E:6]
[F:7, P:7, H:9, I:9, G:11]	[A:0, B;2, C:4, D:5, E:6, J:6]
[P:7, H:9, I:9, L:9, G:10, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7]
[I:8, H:9, L:9, G:10, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7]
[H:9, L:9, G:10, Q:10, O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8]
[L:9, G:10, K:10, Q:10, O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9]
[G:10, K:10, Q:10, O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9, L:9]
[K:10, Q:10, O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9, L:9, G:10]
[Q:10, O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9, L:9, G:10, K:10]
[O:11, M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9, L:9, G:10, K:10, Q:10]
[M:12]	[A:0, B;2, C:4, D:5, E:6, J:6, F:7, P:7, I:8, H:9, L:9, G:10, K:10, Q:10, O:11]

3.3 Answer - Tree



3.4 Answer - Solution

The following sequence is the solution to reach the goal state, $\{O\}$.

$$ACEPIO\ (Total\ Cost\ =\ 11)$$