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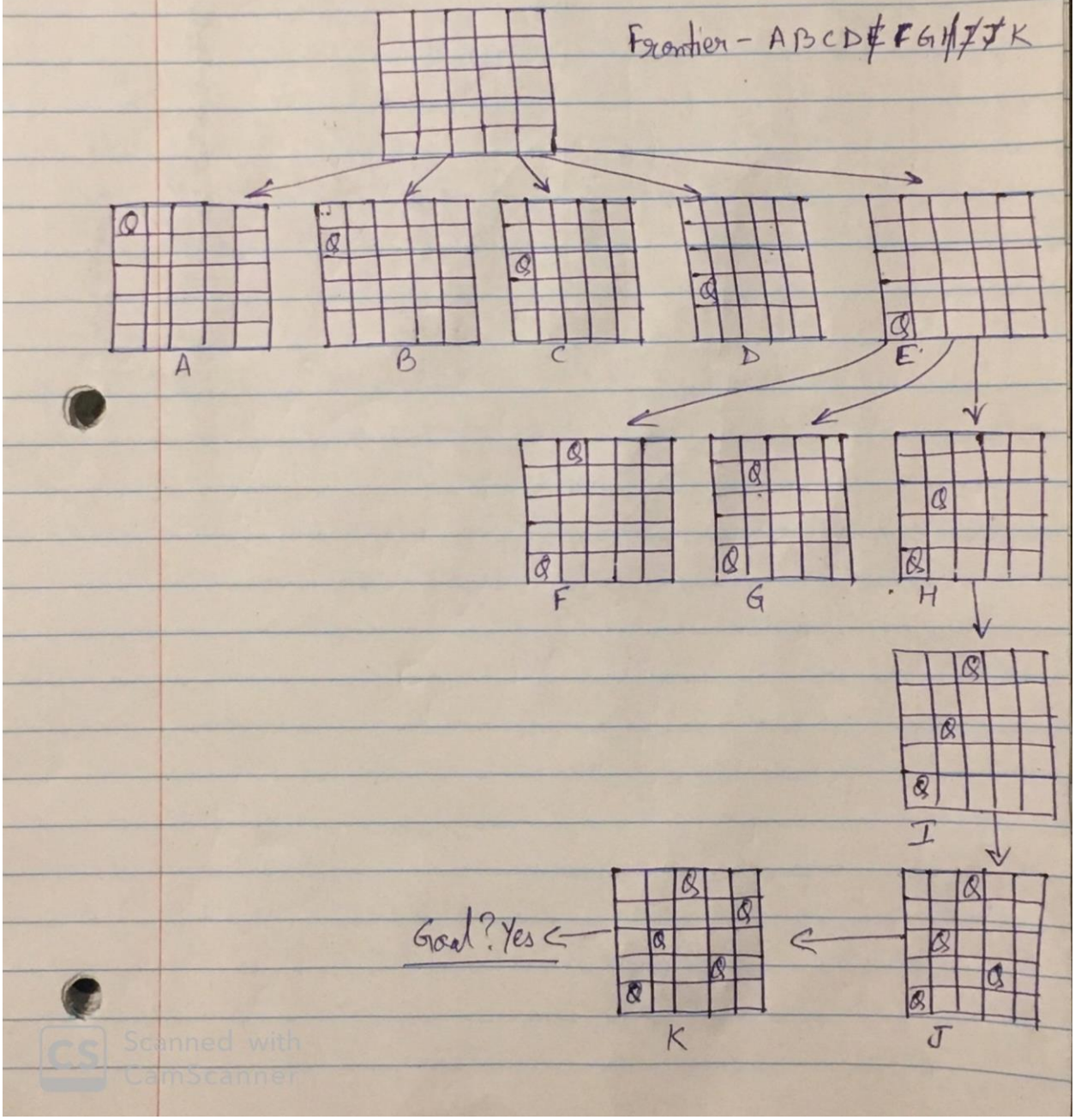
CS-480 Homework 1

Q1. 5-Queens Problem (DFS)



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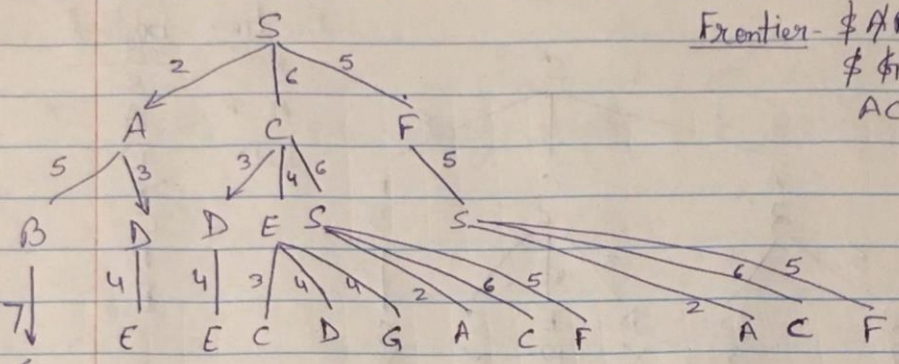
Q2 BFS tree for the figure-



Frontier- ~~S A C F B D D E S S~~
S G E E C D G A C F
A C F

Goal? Yes.

Path- $S \xrightarrow{2} A \xrightarrow{5} B \xrightarrow{7} G$

Cost- $2 + 5 + 7 = 14$

Frontier-

→ S
→ A, C, F
→ C, F, B, D
→ F, B, D, D, E, S
→ B, D, D, E, S, S
→ D, D, E, S, S, G
→ D, E, S, S, G, E
→ E, S, S, G, E, E
→ S, S, G, E, E, C, D, G
→ S, G, E, E, C, D, G, A, C, F
→ G, E, E, C, D, G, A, C, F, A, C, F
→ E, E, C, D, G, A, C, F, A, C, F

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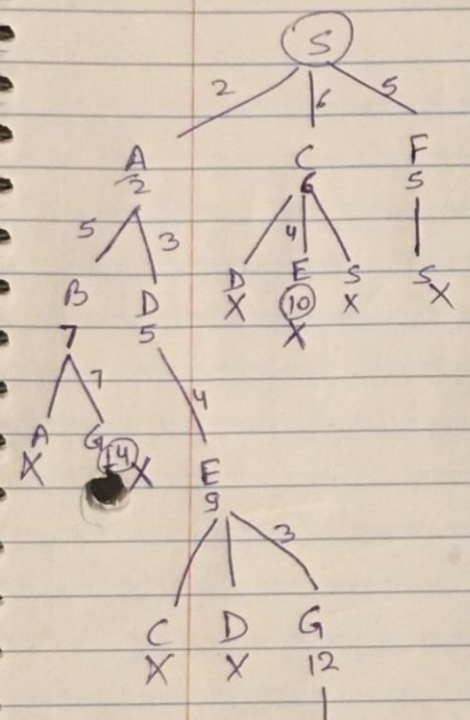
Q3. Unified Cost Search (Modified Graph Search) - Uses g(n)



Goal? Yes.

Frontier	Explored Set
S	—
A, C, F	S
C, F, B, D	S, A
C, B, D	S, A, F
C, B, E	S, A, F, D
B, E,	S, A, F, D, C
E G	S, A, F, D, C, B
G	S, A, F, D, C, B, E
—	S, A, F, D, C, B, E, G

Path - S → A → D → E → G.

Cost → 2+3+4+3 = 12

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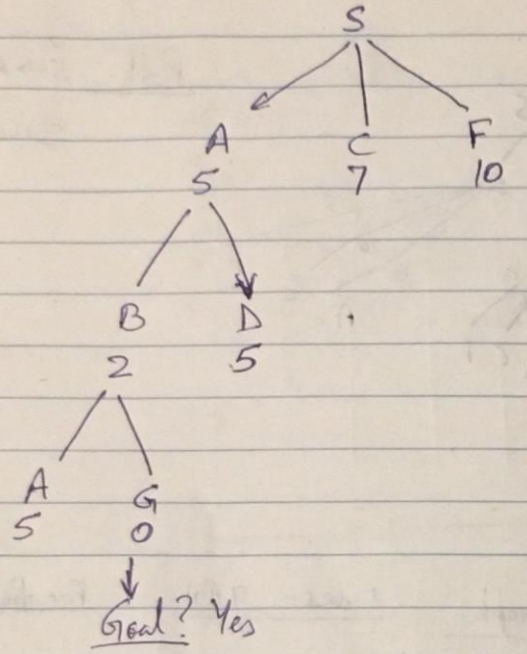
(4) Greedy Best First Search Using h(n)



Frontier: ~~S A C F B D A~~

Path ⇒ S → A - B - G

Cost - 2 + 5 + 7 = 14

Frontier -

→ S

→ A, C, F

→ B, D, C, F

→ G, D, A, C, F

→ D, A, C, F

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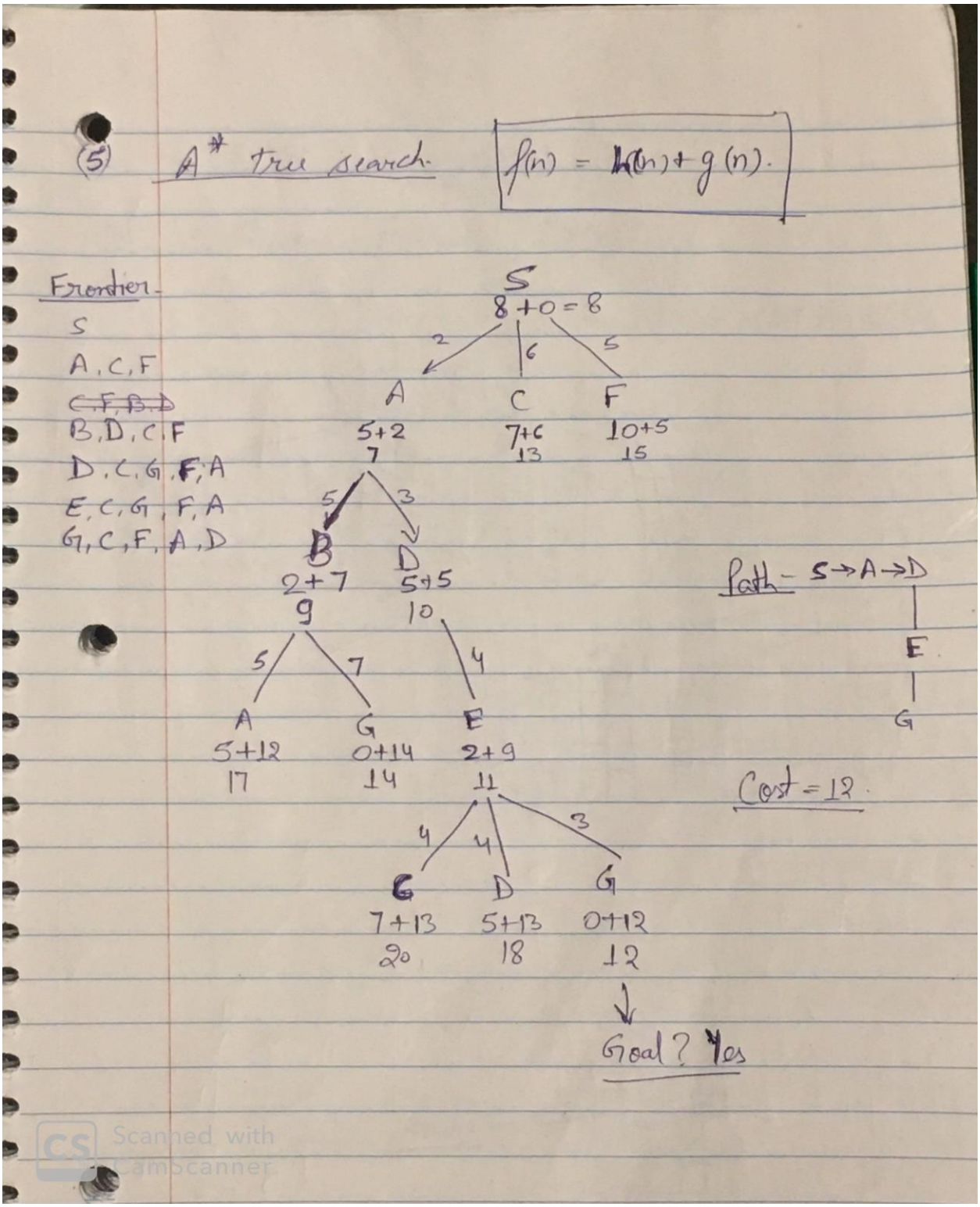

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Q.6. Admissible Heuristic function h^* that dominates every possible admissible heuristic -

To find this, we have to find cheapest cost path from every node the goal (G).

$h^*(n)$	Path
A = 10	A → D → E → G
B = 7	B → G
C = 7	C → E → G
D = 7	D → E → G
E = 3	E → G
F = 17	F → S → A → D → E → G
G = 0	G
S = 12	S → A → D → E → G.

For admissible $h^*(n)$, it does not overestimate the optimal cost. It should be less than or equal to the cheapest cost path.
But for making h^* dominates every possible admissible heuristic for this map we have to take $h^*(n)$ equal to the cheapest cost path for every n.