QUESTION 1-a

Variables: CENG111, CENG213, CENG223, CENG315, CENG331, CENG351

Domain: { (BMB1, 09.30) , (BMB2, 09.30), (BMB1, 13.30) ,

(BMB2, 13.30) , (BMB3, 13.30) , (BMB3, 16.30) }

We can define some useful sets to use in constraints. S1 is a set of available slots that are at 09.30. S2 and S3 are set of available slots at 13.30 and 16.30 respectively. Then, noConflict is the set of all possible pairs that does not conflict according to hour.

S1 = { (BMB1, 09.30) , (BMB2, 09.30) }

S2 = { (BMB1, 13.30) , (BMB2, 13.30) , (BMB3, 13.30) }

S3 = { (BMB3, 16.30) }

noConflict = S1xS2 U S2xS1 U S1xS3 U S3xS1 U S2xS3 U S3xS2

Now, we can define constraints as follows:

Constraints:

- alldiff(CENG111, CENG213, CENG223, CENG315, CENG331, CENG351)
- (CENG213, CENG223) ∈ noConflict
- (CENG315, CENG331) ∈ noConflict
- (CENG315, CENG351) ∈ noConflict
- (CENG331, CENG351) ∈ noConflict

QUESTION 1-b

Let's numerate and color domain elements to make it easier to track:

(BMB1, 09.30), (BMB2, 09.30), (BMB1, 13.30), (BMB2, 13.30), (BMB3, 13.30), (BMB3, 16.30)					
1	2	3	4	5	6

CENG111	CENG213	CENG223	CENG315	CENG331	CENG351
1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
1	2 3 4 5 6	2 3 4 5 6	2 3 4 5 6	2 3 4 5 6	2 3 4 5 6
1	2	3 4 5 6	3 4 5 6	3 4 5 6	3 4 5 6
1	2	3	4 5 6	4 5 6	4 5 6
1	2	3	4	6	6
1	2	3	4	6	

No possible value for CENG351, so search is terminated.

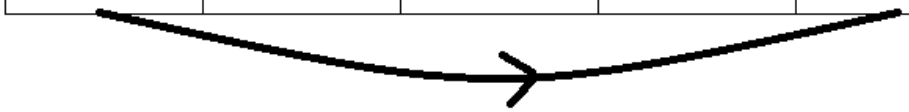
QUESTION 1-c

Again, we can use numerated and colored domain elements as follows:

(BMB1, 09.30), (BMB2, 09.30), (BMB1, 13.30), (BMB2, 13.30), (BMB3, 13.30), (BMB3, 16.30)					
1	2	3	4	5	6

CENG111	CENG213	CENG223	CENG315	CENG331	CENG351
1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6	1 2 3 4 5 6
2 3 4 5 6	1	3 4 5 6	2 3 4 5 6	2 3 4 5 6	2 3 4 5 6
2 3 4 5	1	6	2 3 4 5	2 3 4 5	2 3 4 5
2 4 5	1	6	3	2	2

CENG111	CENG213	CENG223	CENG315	CENG331	CENG351
~~2~~ 4 5	1	6	3	2	2

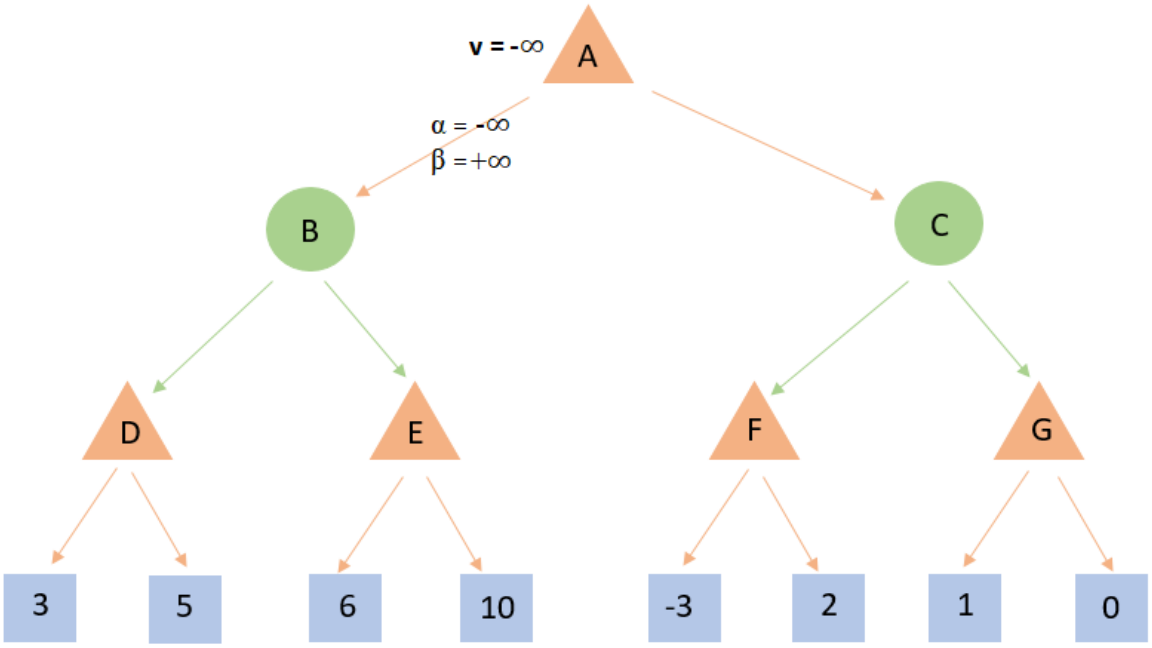


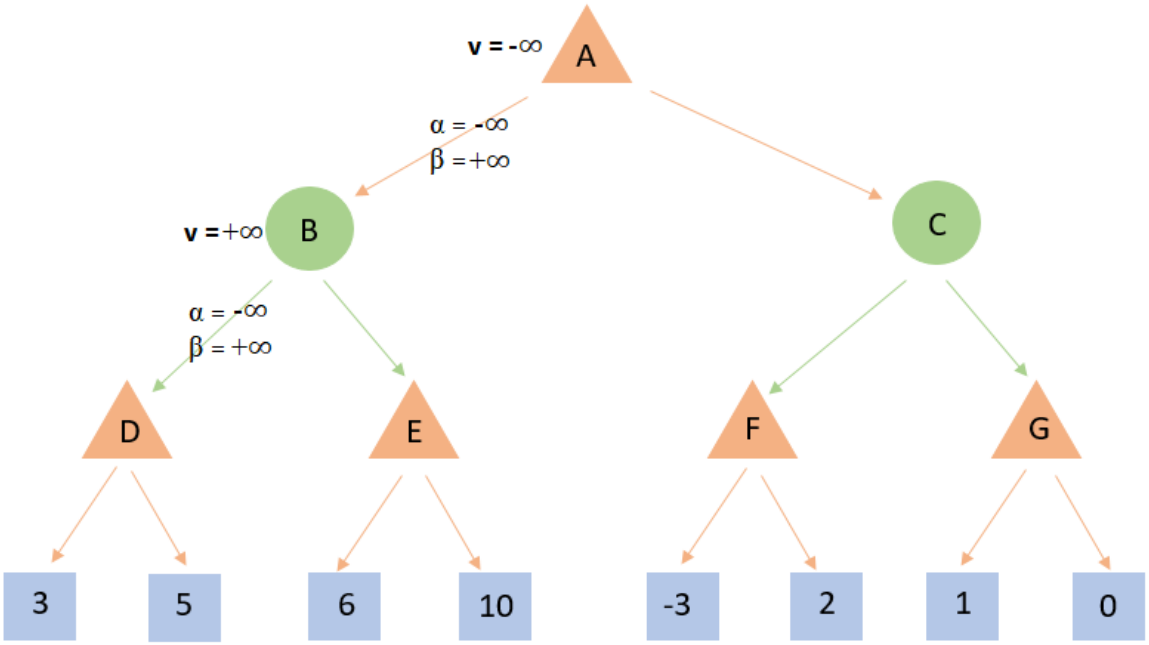
CENG111	CENG213	CENG223	CENG315	CENG331	CENG351
~~2~~ 4 5	1	6	3	~~2~~	2

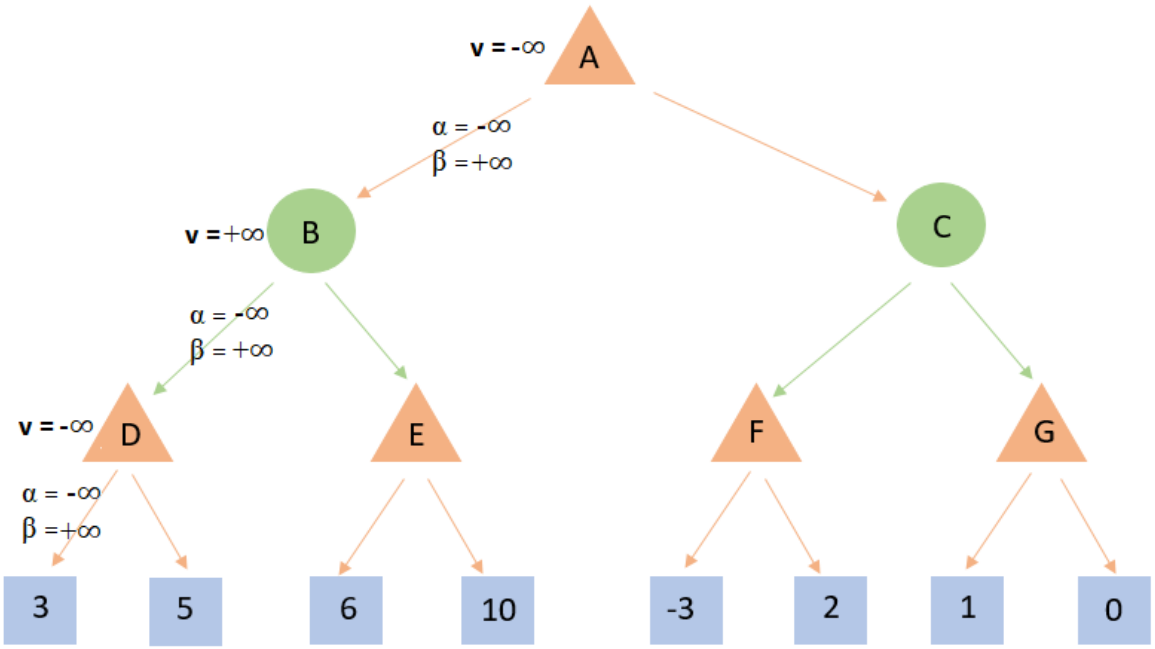
No possible value for CENG331, so search is terminated.

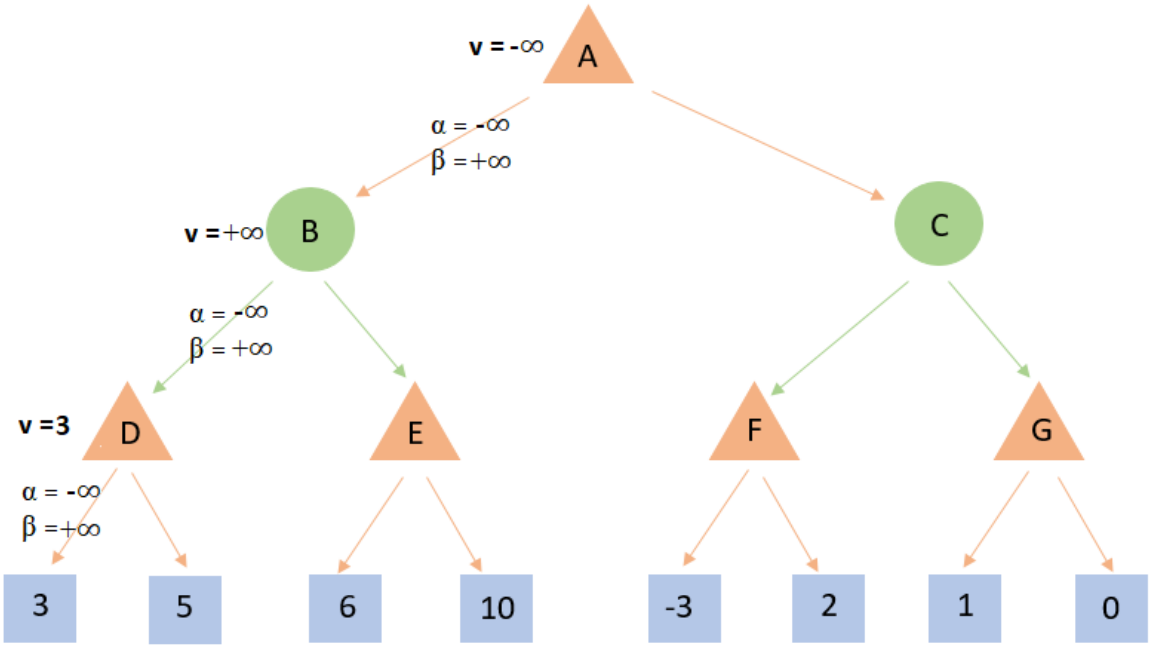
QUESTION 2

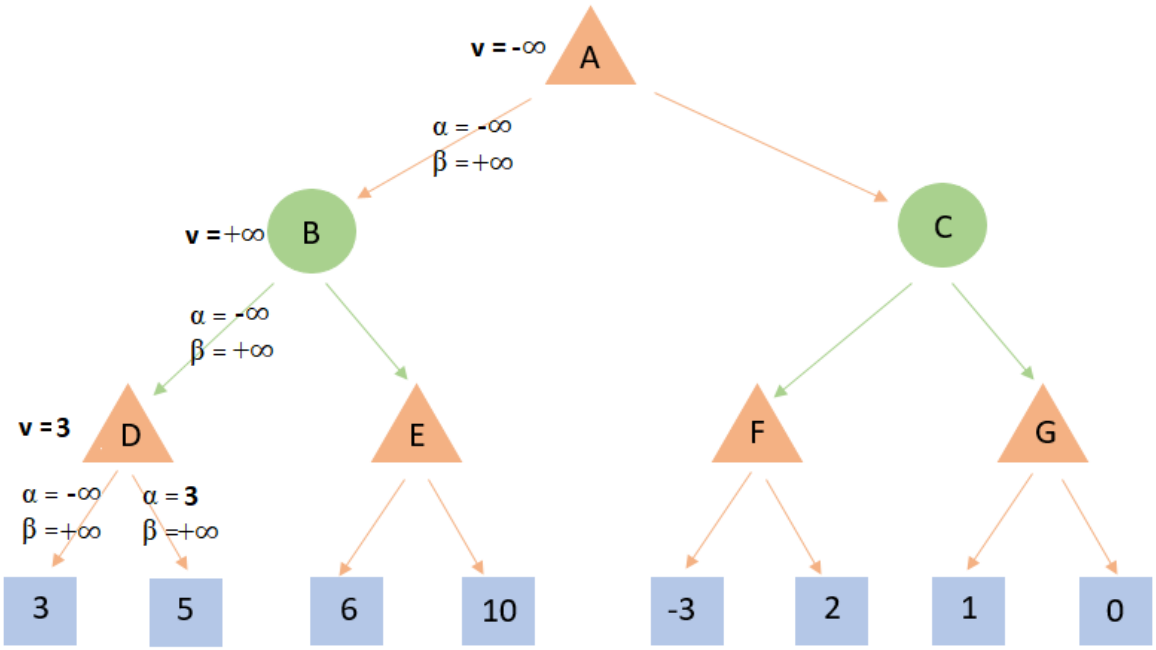
v, α, β values of all explored nodes and where α/β-pruning occurs in the tree are shown below figures.

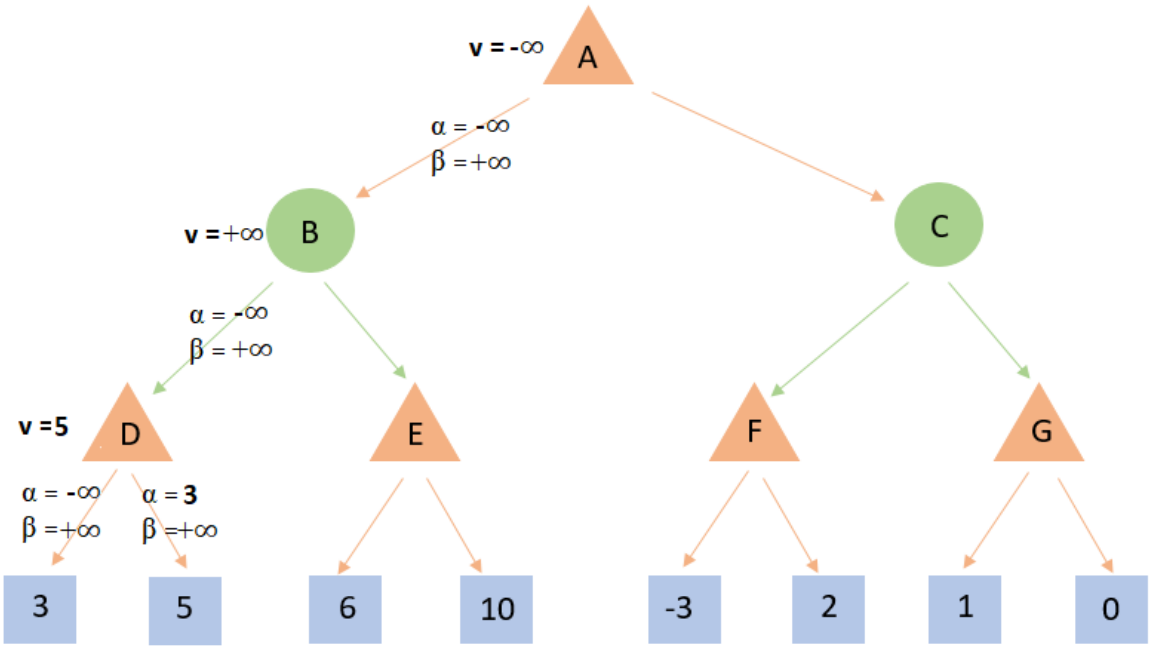


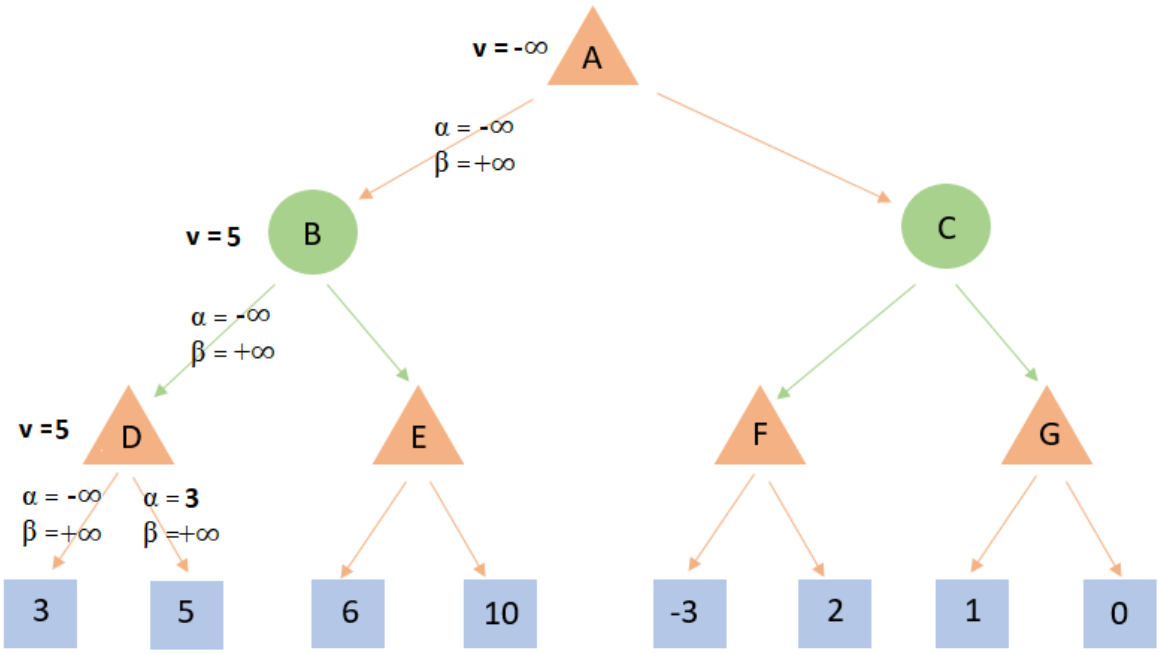


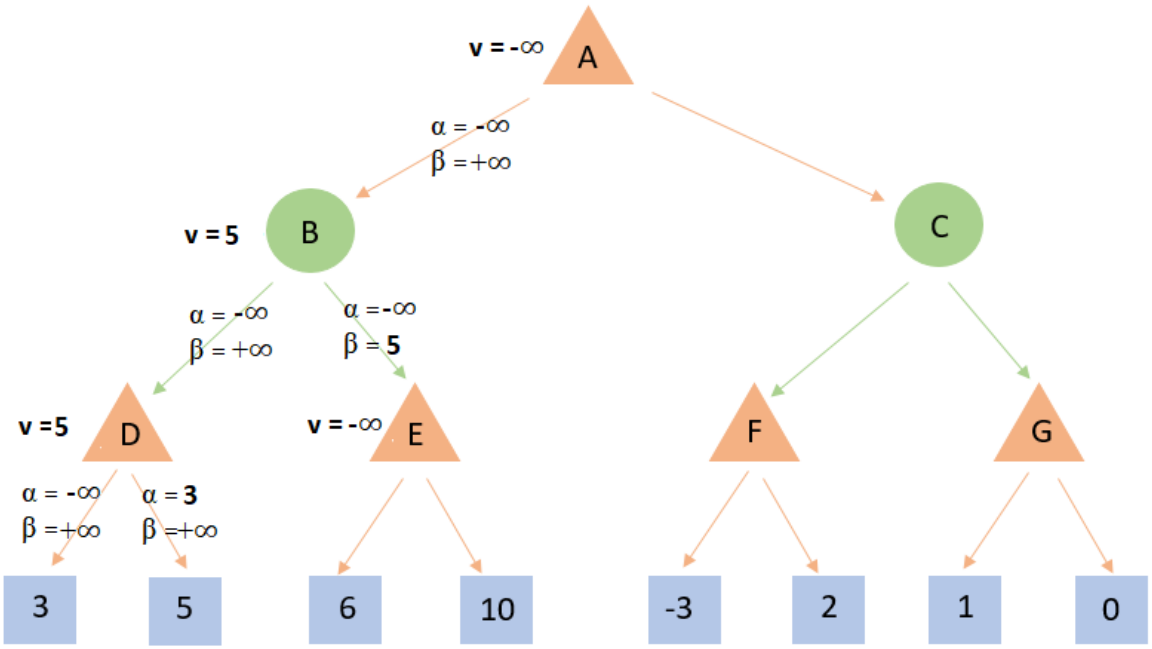

v = -∞
A
α = -∞
β = +∞
v = +∞
B
C
α = -∞
β = +∞
v = -∞
D
E
F
G
α = -∞
β = +∞
3
5
6
10
-3
2
1
0

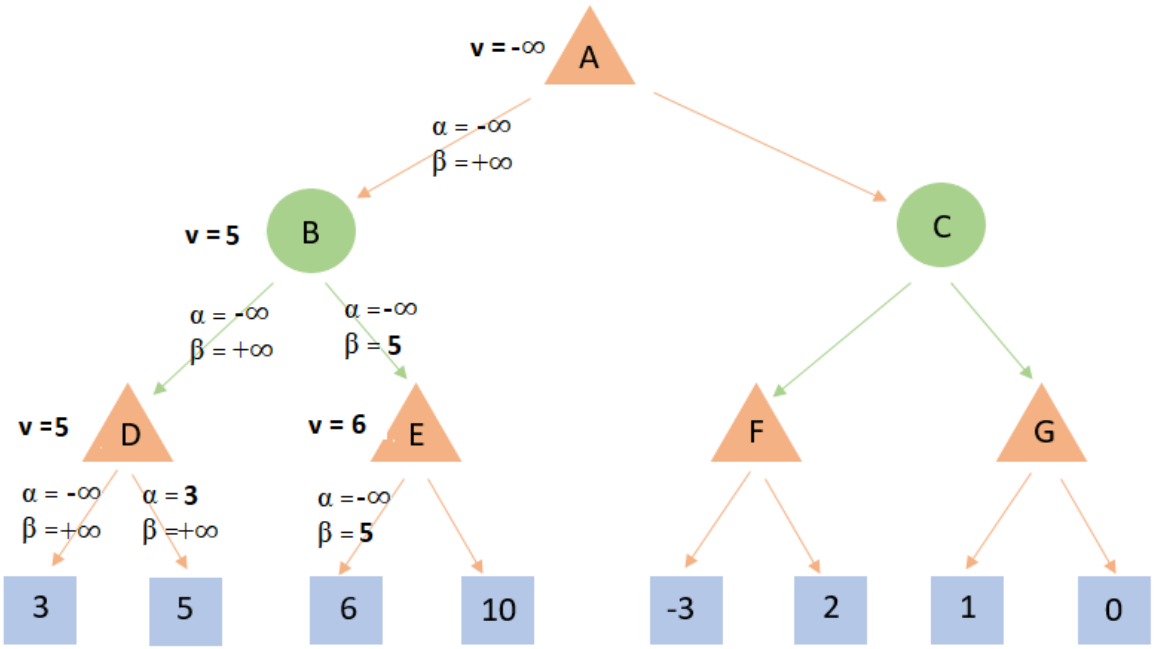

v = -∞
A
α = -∞
β = +∞
v = +∞
B
C
α = -∞
β = +∞
v =3
D
E
F
G
α = -∞
β = +∞
3
5
6
10
-3
2
1
0

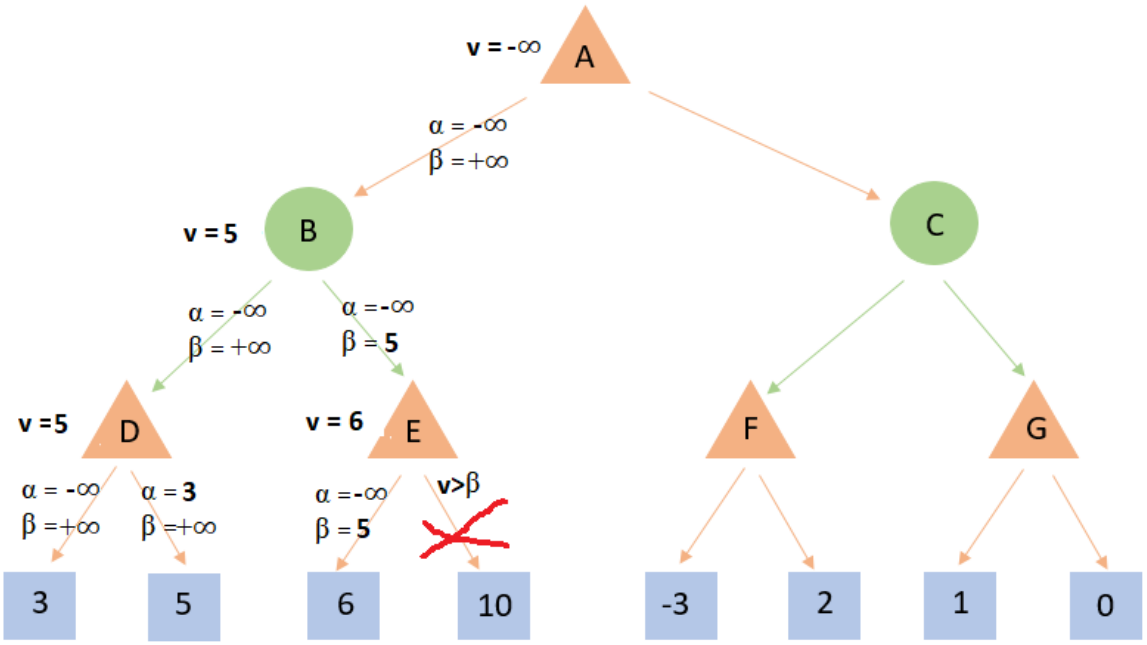

v = -∞
A
α = -∞
β = +∞
v = +∞
B
C
α = -∞
β = +∞
v = 3
D
E
F
G
α = -∞
β = +∞
α = 3
β = +∞
3
5
6
10
-3
2
1
0

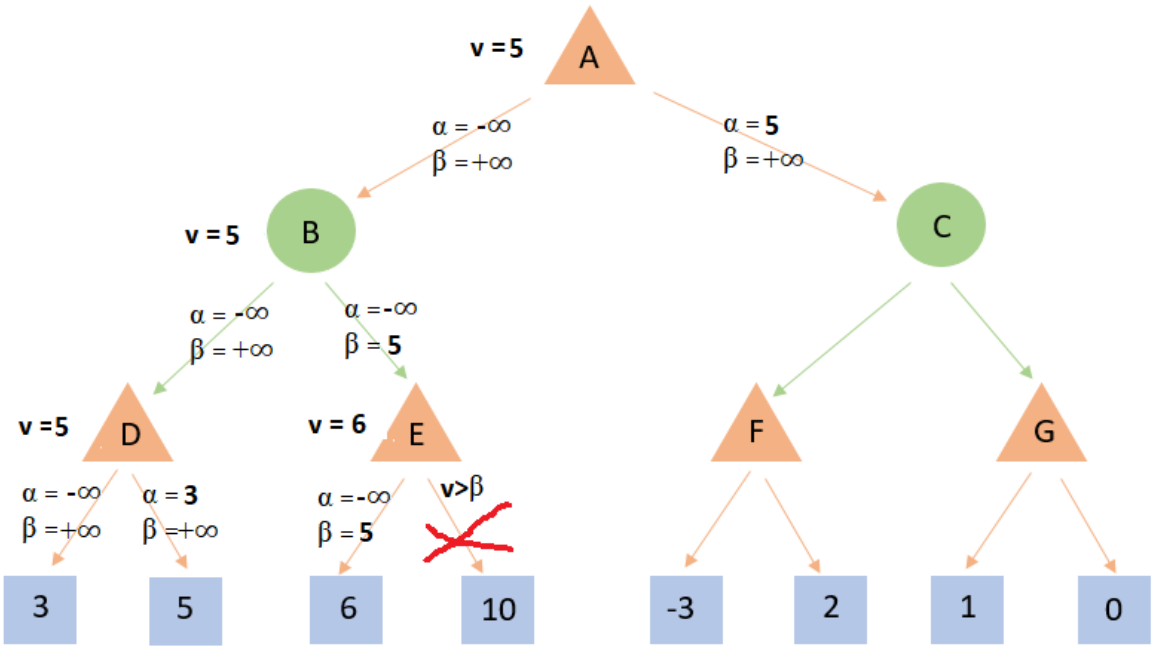

v = -∞
A
α = -∞
β = +∞
v = +∞
B
C
α = -∞
β = +∞
v = 5
D
E
F
G
α = -∞
β = +∞
α = 3
β = +∞
3
5
6
10
-3
2
1
0

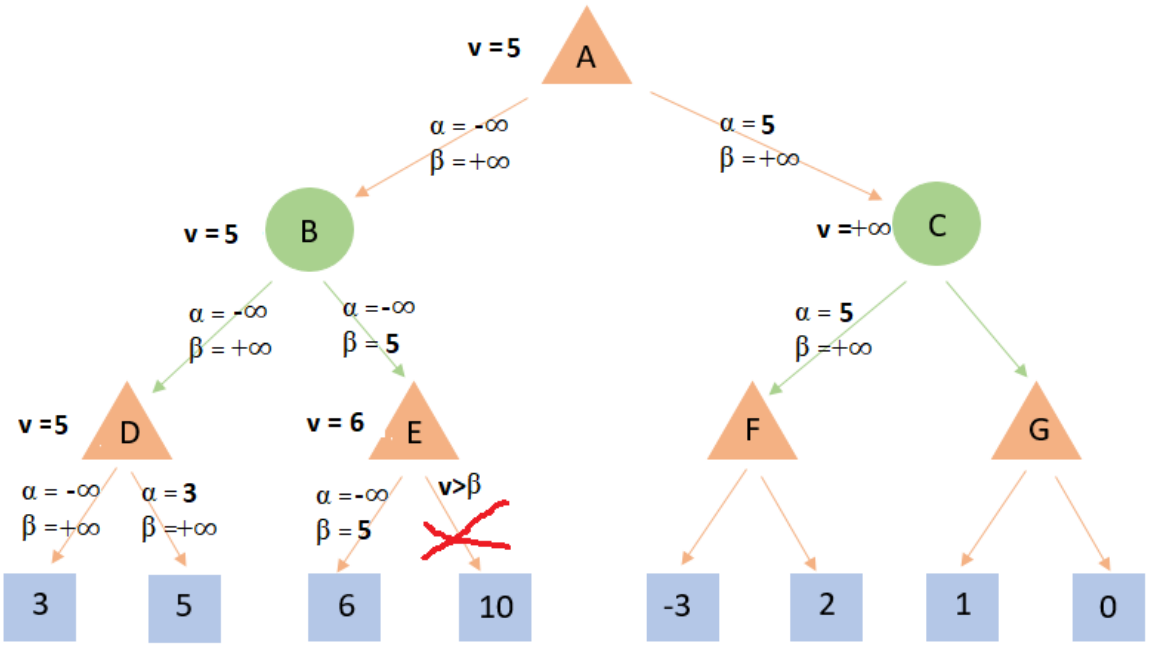

v = -∞
A
α = -∞
β = +∞
v = 5
B
C
α = -∞
β = +∞
v =5
D
E
F
G
α = -∞
β =+∞
α = 3
β =+∞
3
5
6
10
-3
2
1
0

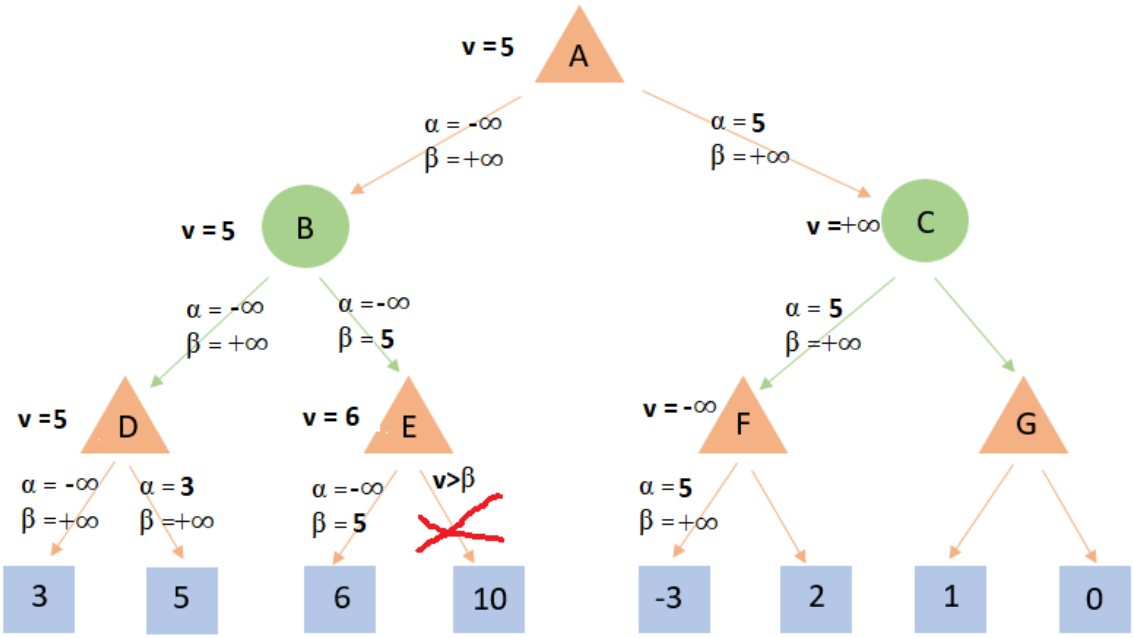

v = -∞
A
α = -∞
β =+∞
v = 5
B
C
α = -∞
β = +∞
α =-∞
β = 5
v =5
D
v = -∞
E
F
G
α = -∞
β =+∞
α = 3
β =+∞
3
5
6
10
-3
2
1
0

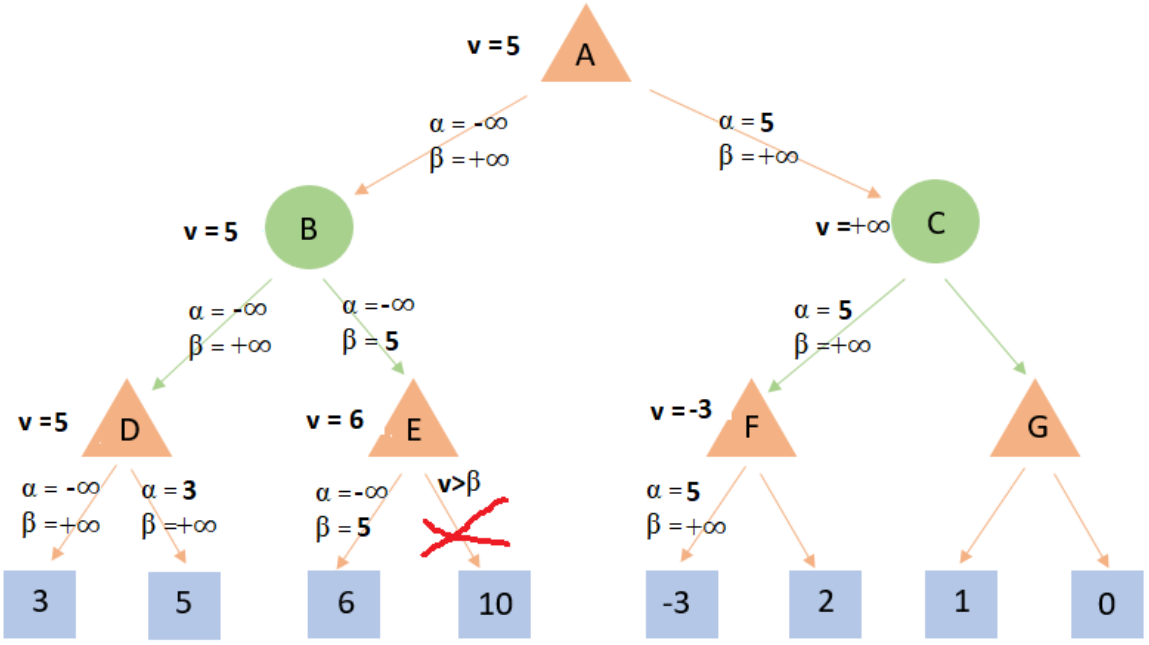

v = -∞
A
α = -∞
β = +∞
v = 5
B
C
α = -∞
β = +∞
α = -∞
β = 5
v =5
D
v = 6
E
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
3
5
6
10
-3
2
1
0

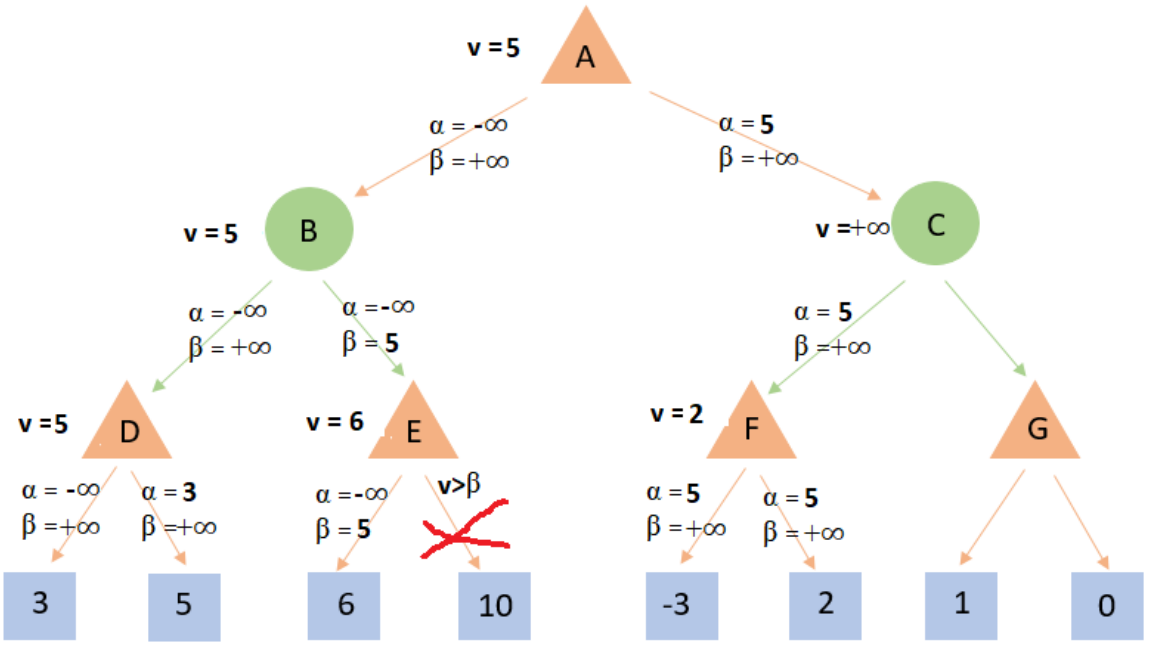

v = -∞
A
α = -∞
β = +∞
v = 5
B
C
α = -∞
β = +∞
α = -∞
β = 5
v =5
D
v = 6
E
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
v>β
3
5
6
10
-3
2
1
0

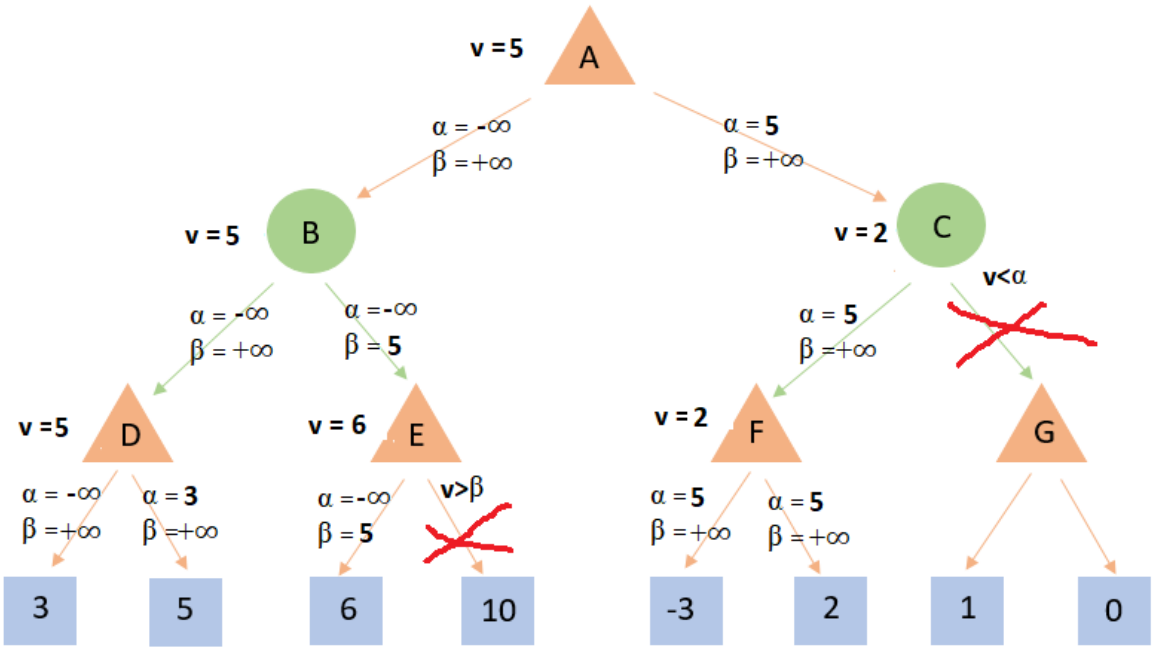

v =5
A
α = -∞
β =+∞
α = 5
β =+∞
v = 5
B
C
α = -∞
β = +∞
α =-∞
β = 5
v =5
D
v = 6
E
F
G
α = -∞
β =+∞
α = 3
β =+∞
α =-∞
β = 5
v>β
3
5
6
10
-3
2
1
0


v =5
A
α = -∞
β =+∞
α = 5
β =+∞
v = 5
B
v =+∞
C
α = -∞
β = +∞
α =-∞
β = 5
α = 5
β =+∞
v =5
D
v = 6
E
F
G
α = -∞
β =+∞
α = 3
β =+∞
α =-∞
β = 5
v>β
3
5
6
10
-3
2
1
0

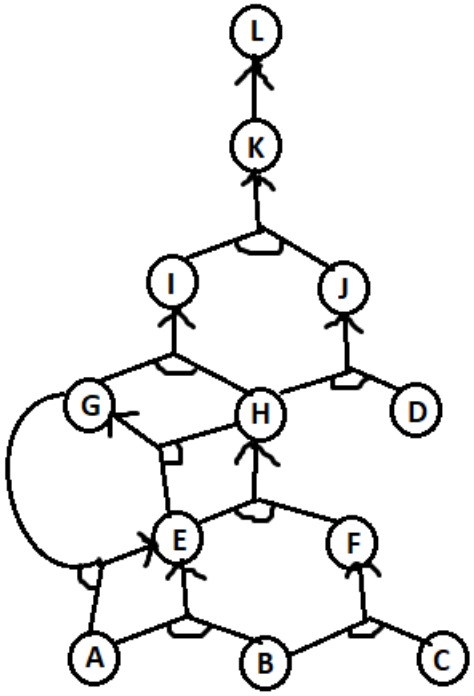

v = 5
A
α = -∞
β = +∞
α = 5
β = +∞
v = 5
B
v =+∞
C
α = -∞
β = +∞
α = -∞
β = 5
α = 5
β = +∞
v =5
D
v = 6
E
v = -∞
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
v>β
α = 5
β = +∞
3
5
6
10
-3
2
1
0


v = 5
A
α = -∞
β = +∞
α = 5
β = +∞
v = 5
B
v =+∞
C
α = -∞
β = +∞
α = -∞
β = 5
α = 5
β = +∞
v =5
D
v = 6
E
v = -3
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
v>β
α = 5
β = +∞
3
5
6
10
-3
2
1
0

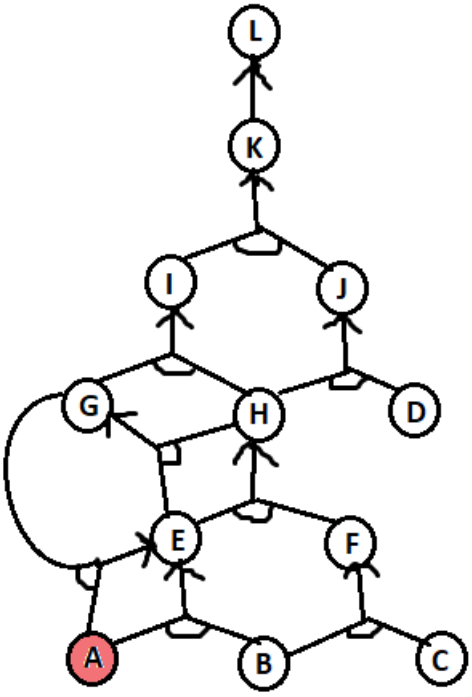

v = 5
A
α = -∞
β = +∞
α = 5
β = +∞
v = 5
B
v = +∞
C
α = -∞
β = +∞
α = -∞
β = 5
α = 5
β = +∞
v = 5
D
v = 6
E
v = 2
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
v>β
α = 5
β = +∞
α = 5
β = +∞
3
5
6
10
-3
2
1
0


v = 5
A
α = -∞
β = +∞
α = 5
β = +∞
v = 5
B
v = 2
C
v<α
α = -∞
β = +∞
α = -∞
β = 5
α = 5
β = +∞
v = 5
D
v = 6
E
v = 2
F
G
α = -∞
β = +∞
α = 3
β = +∞
α = -∞
β = 5
v>β
α = 5
β = +∞
α = 5
β = +∞
3
5
6
10
-3
2
1
0

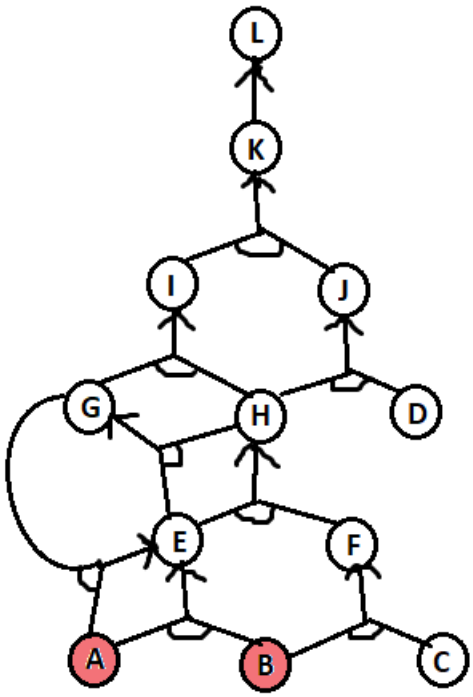
QUESTION 3-a



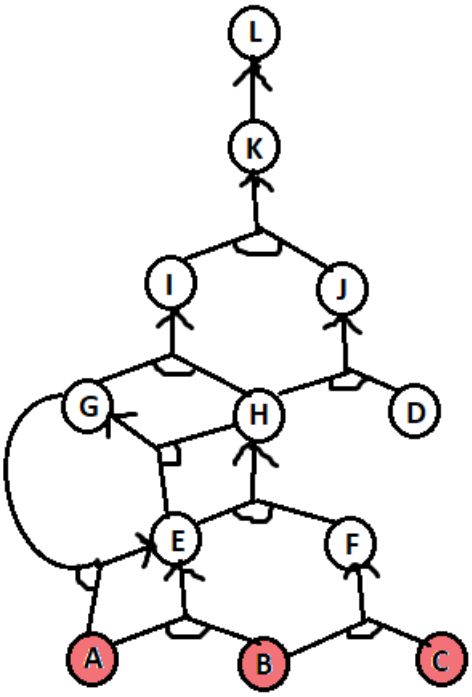
agenda = <A, B, C, D>



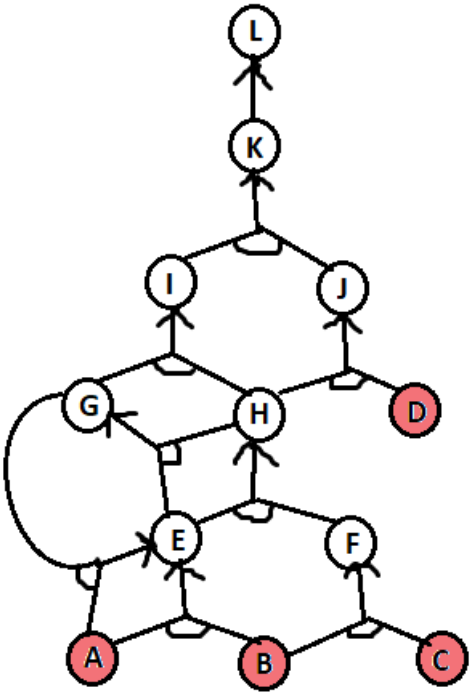
agenda = <B, C, D>



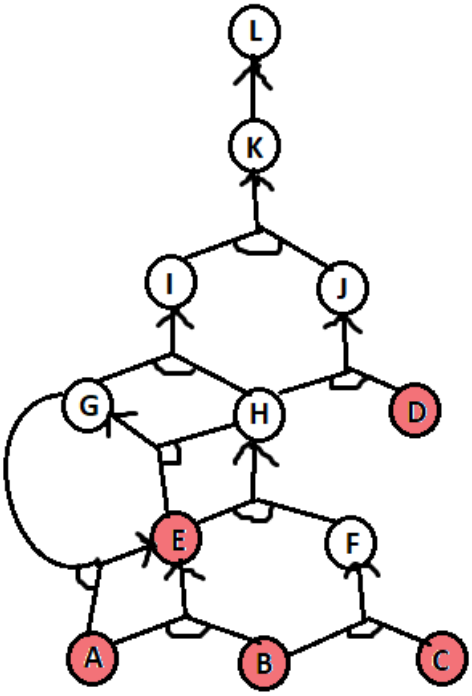
agenda = <C, D, E>



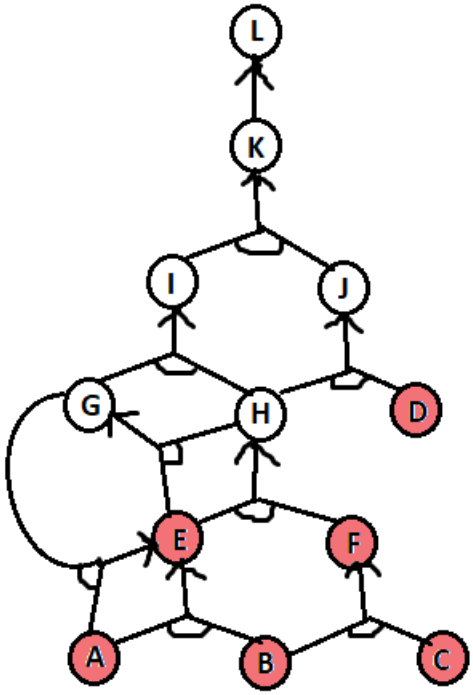
agenda = <D, E, F>



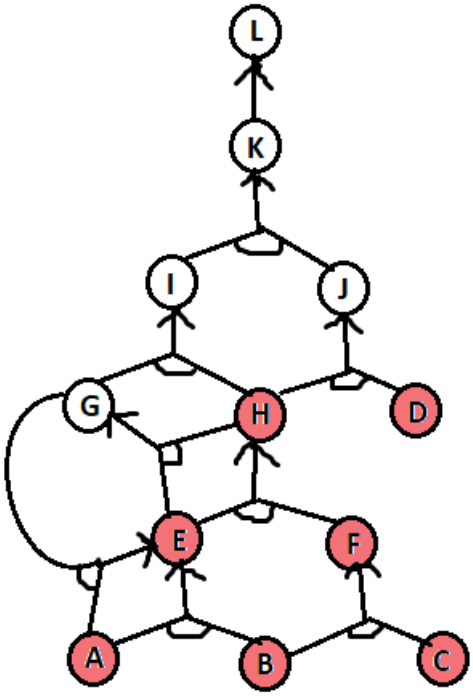
agenda = <E, F>



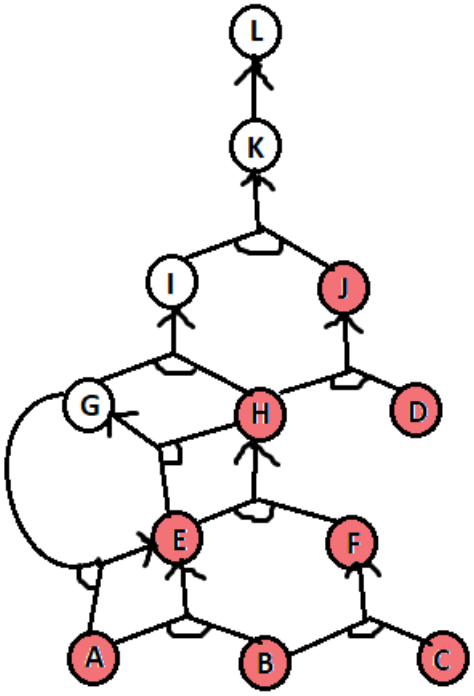
agenda = <F>



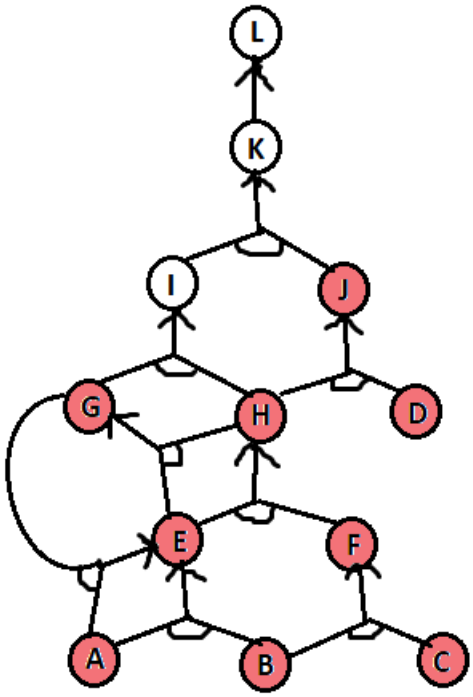
agenda = <H>



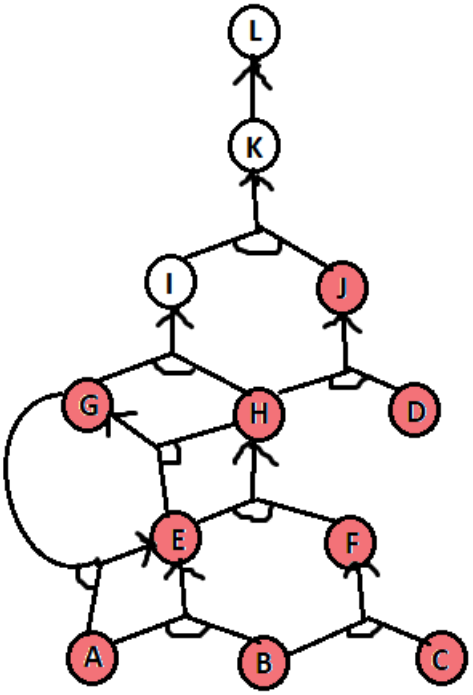
agenda = <J, G>



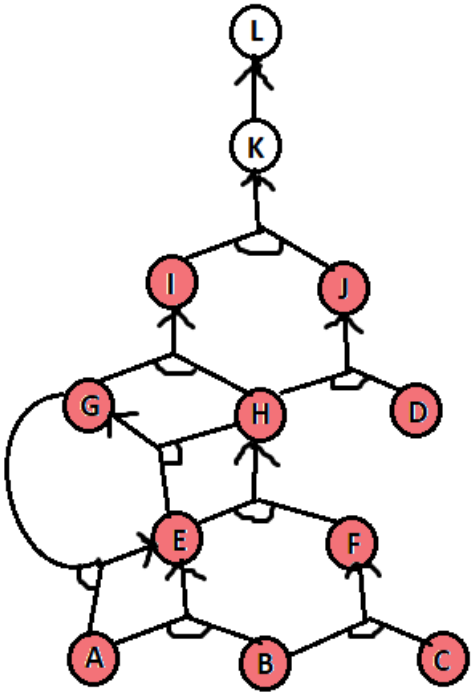
agenda = <G>



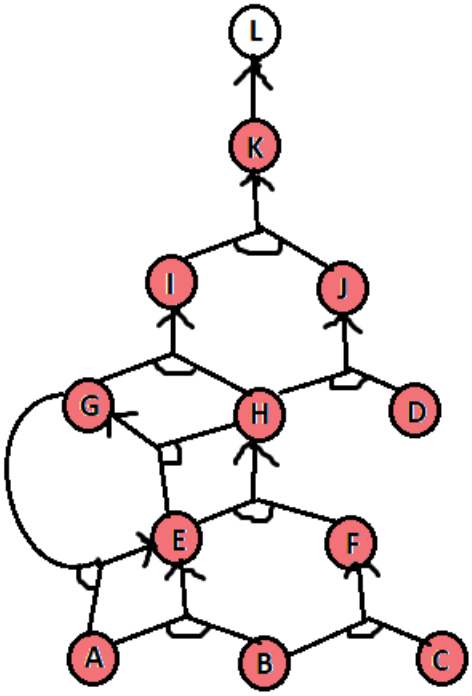
agenda = <E, I>



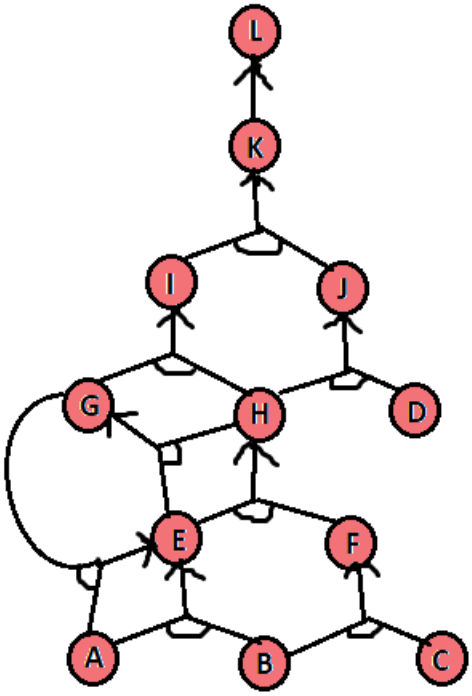
agenda = < I >



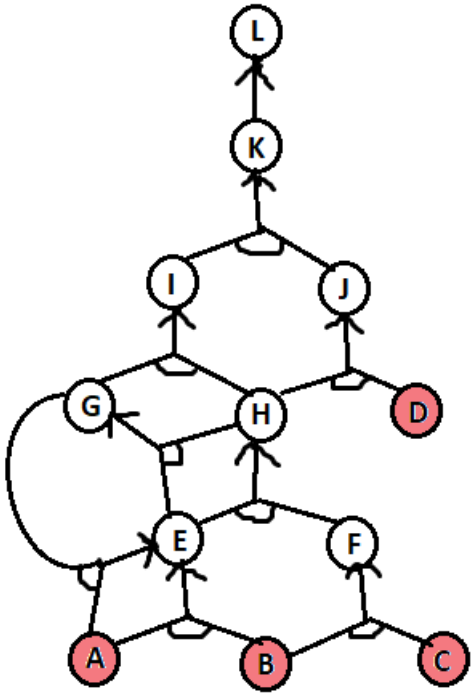
agenda = <K>

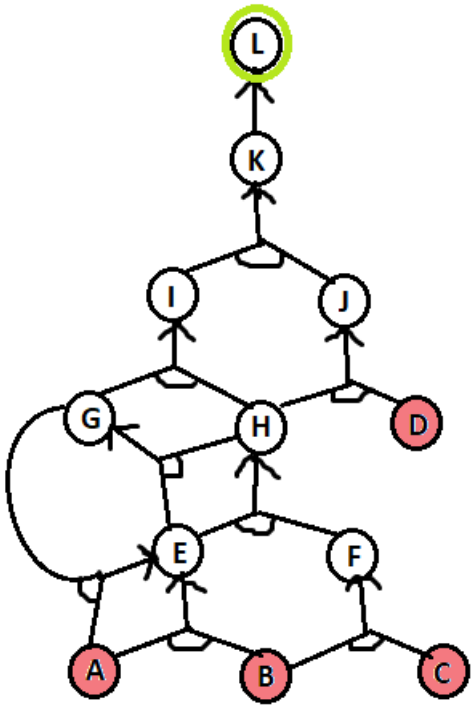


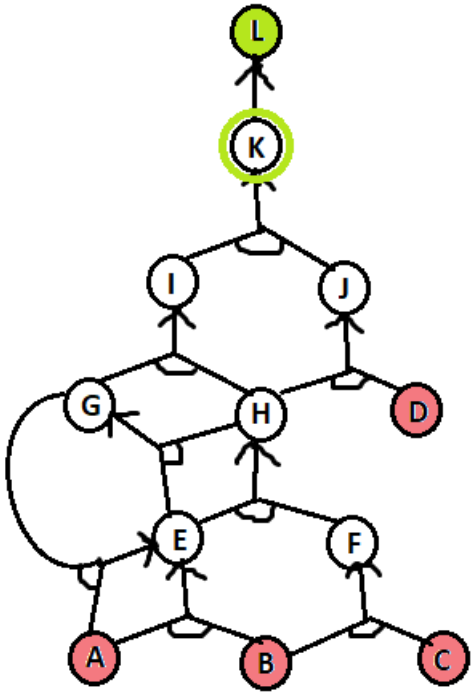
agenda = <L>

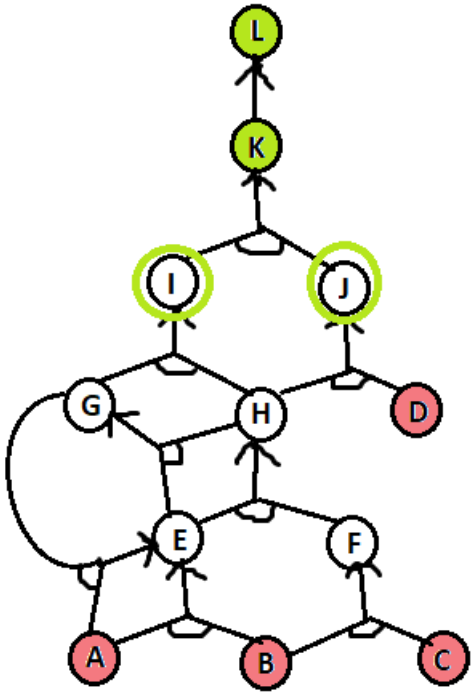


QUESTION 3-b






L
K
I
J
G
H
D
E
F
A
B
C


L
K
I
J
G
H
D
E
F
A
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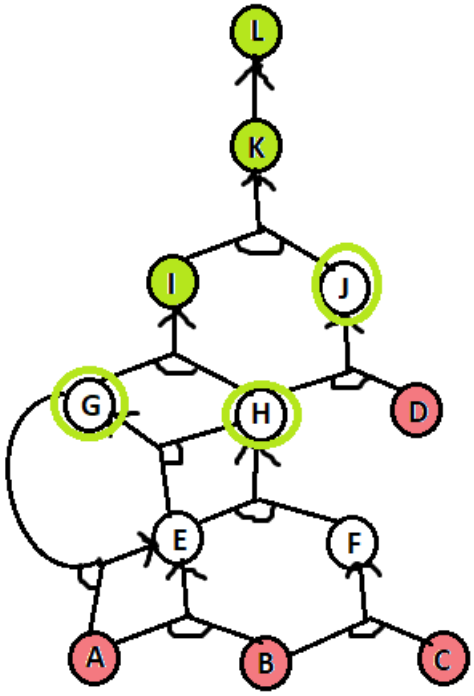
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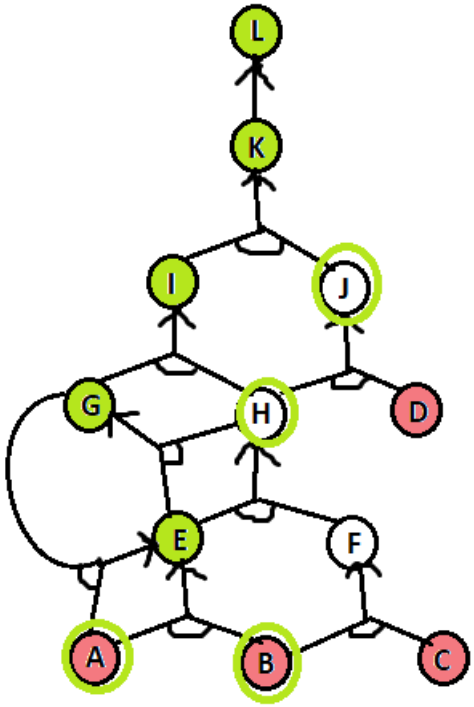
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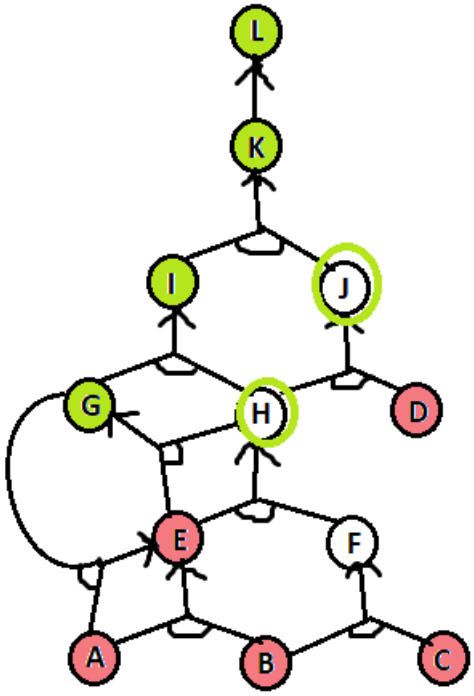
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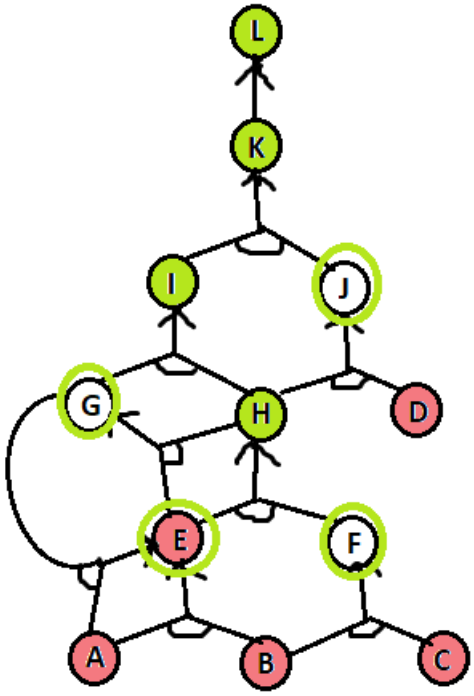
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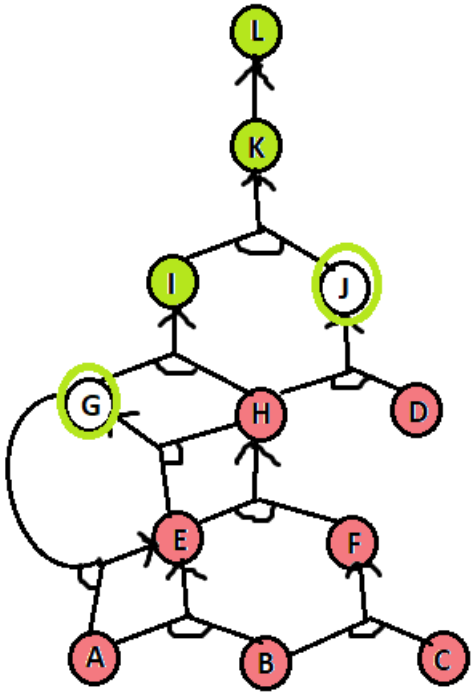
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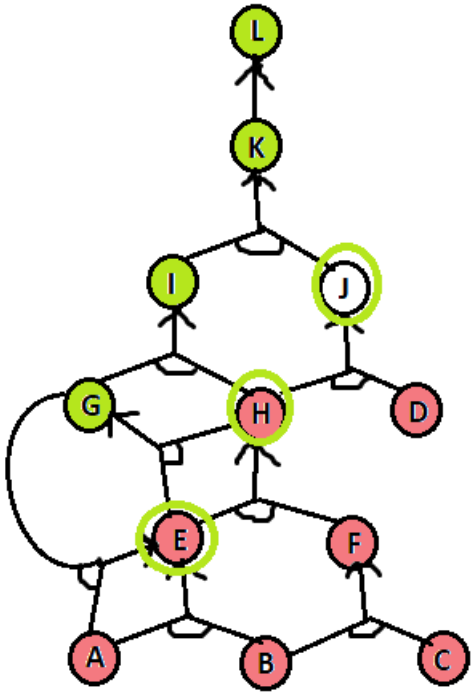
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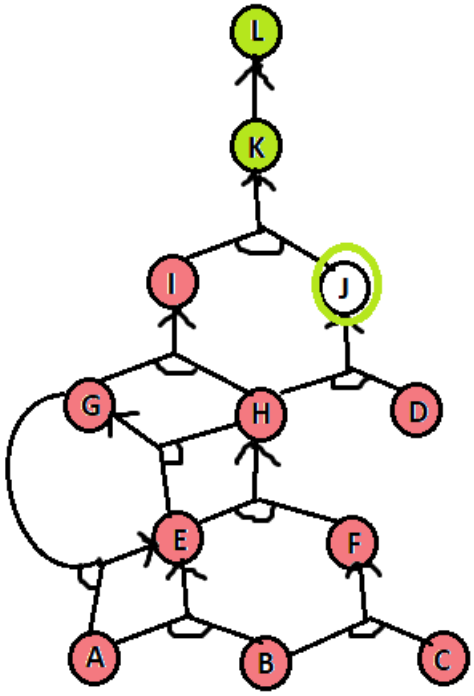
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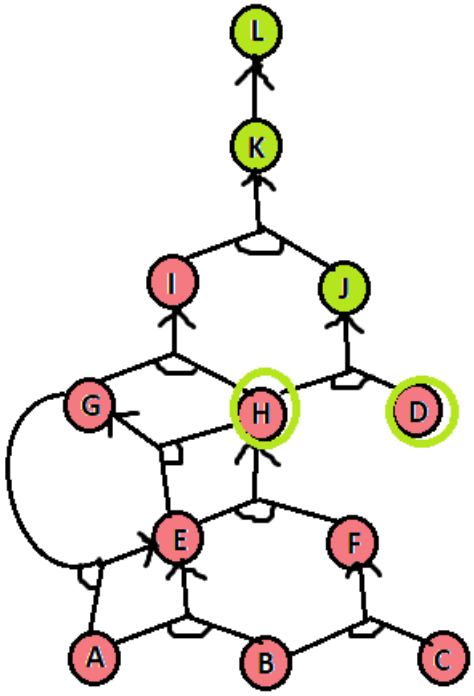
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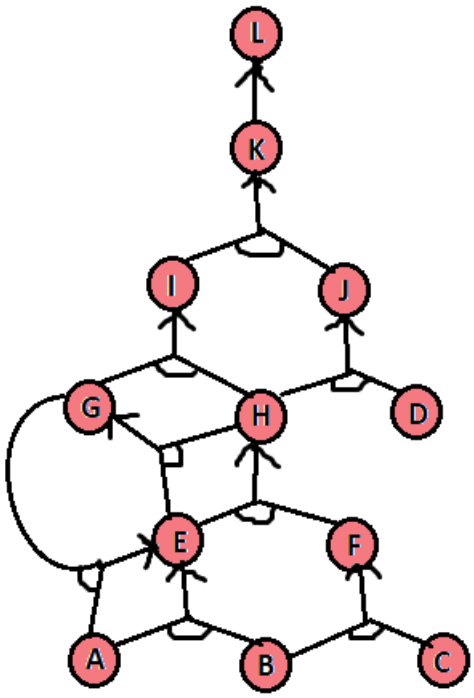
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