

171SROOB - S. DHANASEKAR

MHSE12 - Artificial Intelligence

ASSIGNMENT - 3

March '20

26

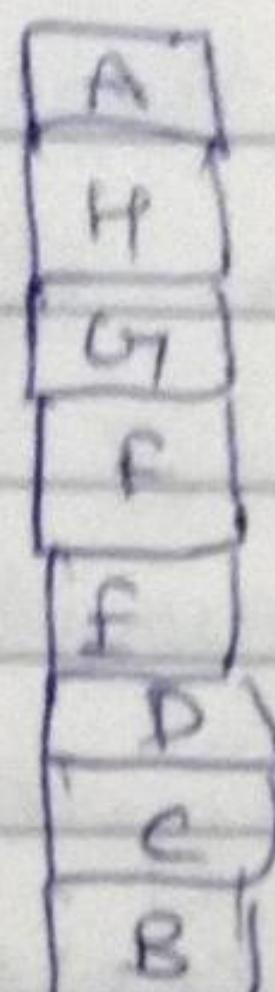
Thursday

(086 - 280)

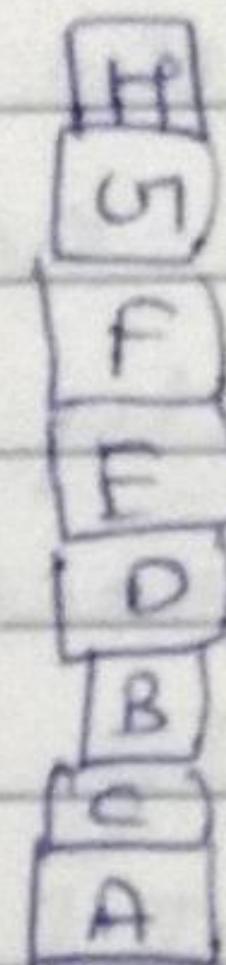
Week 13

Independence Day (Bangladesh)

1. Initial State



Goal State



Local heuristic function

-1	A
+1	H
+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

$$h=0$$

+1	H
+1	G
+1	F
+1	E
+1	D
+1	B
+1	C
+1	A

$$h=8$$

+1	H
+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

~~+1 A~~~~+1 A~~ $h = 2$

Make it current state

+1	H
+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

~~+1 A~~

In local maximal
the shortest
heuristic value.

is 0 for all.
the mode move
we can't find
Sol.

+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

~~+1 A~~ $h=0$

-1	A
+1	H
+1	G
+1	F
+1	E
-1	D
-1	C
-1	B

 $h=0$  $h = 0$

Global heuristic function

-7	A
-6	H
-5	G
-4	F
-3	E
-2	D
-1	C
0	B

Initial $h = -28$

+7	H
+6	G
+5	F
+4	E
+3	D
+2	B
+1	C
0	A

Goal $h = 28$

29

Sunday

(089 - 277)

Week: 13

-6	H
-5	G
-4	F
-3	E
-2	D
-1	C
0	B

0[A]

$h = -21$

March '20

30

Week 14

(090 - 276)

Monday

G	
F	
E	
D	
C	
B	
O	A

$$h = -16$$

	5	G
-4		F
-3		E
-2		D
-1		C
O	H	B
O	A	

$$h = -15$$

	-7	A
-6		H
-5		G
-4		F
-3		E
-2		D
-1		C
O	B	

$$h = -28$$

Better State

	F	
-1	E	
-2	D	
-3	C	
O	H	B
O	A	

$$h = -10$$

	E	
-3	D	
-2	C	
-1	H	
O	B	
O	A	F

$$h = -6$$

$$(h = -11)$$

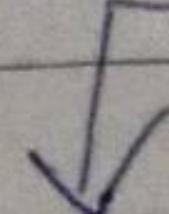
$$\text{Keep } H \text{ on } F \\ (h = -11)$$

$$\text{Keep } U \text{ on } H \\ (h = -11)$$

$$\text{Keep } U \text{ on } F \\ (h = -11)$$

G on H => -7	E on G => -4	F on U => -7
G on E => -10	E on H = -4	F on H = -7
G on A => -7	E on A = -10	F on E = -10
G on F => -7	E on F = -4	F on A = -7
H on G =>	A on U = -7	
H on E =>	A on H = -7	
H on A =>	A on E = -10	
H on F =>	A on F = -7	

D

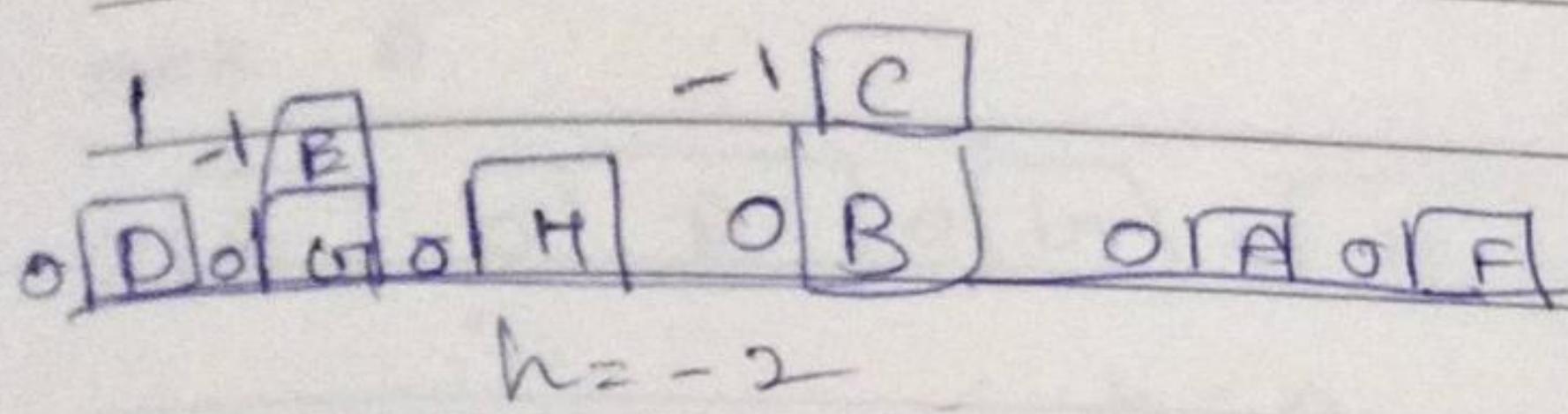


E	
-1	C
O	H
O	B
O	A
O	F

$$h = -4$$



Notes

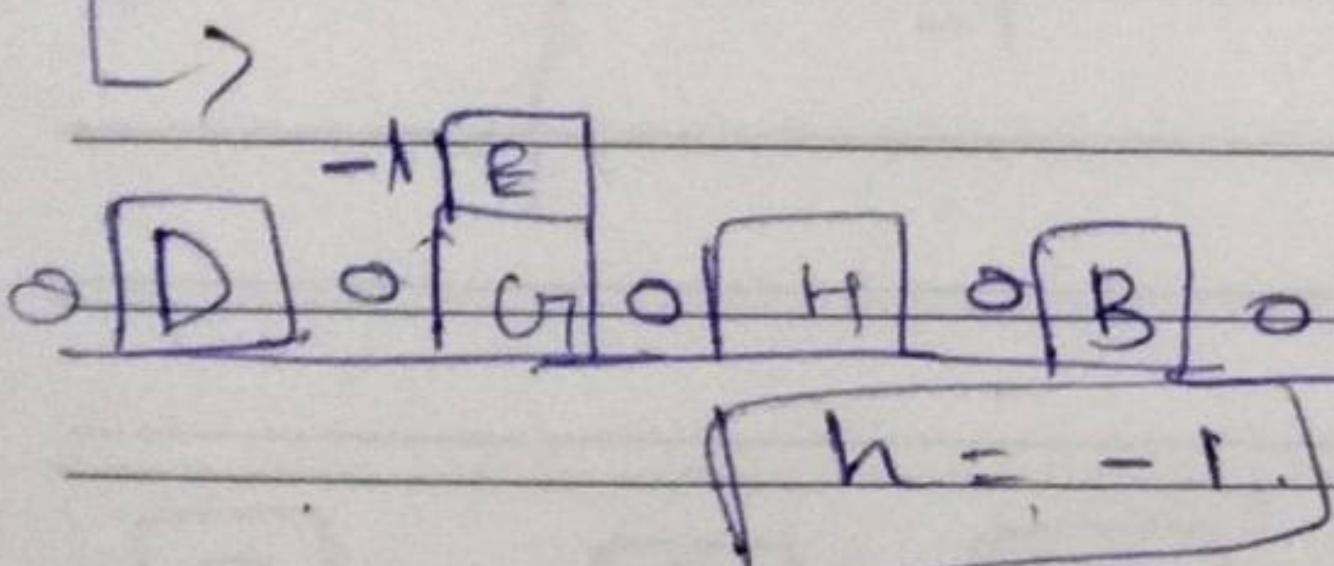


$E \text{ on } H = -4$	$H \text{ on } E = -6$
$E \text{ on } D = -6$	$H \text{ on } D = -7$
$E \text{ on } A = -4$	$H \text{ on } A = -5$
$E \text{ on } F = -4$	$H \text{ on } F = -5$

better

$D \text{ on } E = -4$	$A \text{ on } E = -6$
$D \text{ on } H = -3$	$A \text{ on } H = -5$
$D \text{ on } A = -3$	$A \text{ on } P = -7$
$D \text{ on } F = -3$	$A \text{ on } F = -5$

$F \text{ on } E = -6$	$F \text{ on } A = -5$
$F \text{ on } H = -5$	$F \text{ on } H = -5$
$F \text{ on } D = -7$	



$D \text{ on } E = -4$	$E \text{ on } D = -2$
$D \text{ on } H = -3$	$E \text{ on } H = -2$
$D \text{ on } C = -4$	$E \text{ on } C = -3$
$D \text{ on } A = -3$	$E \text{ on } A = -2$
$D \text{ on } F = -3$	$E \text{ on } F = -1$

$C \text{ on } D = -2$	$D \text{ on } A = -3$
$C \text{ on } E = -3$	$D \text{ on } F = -3$
$C \text{ on } H = -2$	$A \text{ on } D = -3$
$C \text{ on } A = -2$	$A \text{ on } C = -4$
$C \text{ on } F = -2$	$A \text{ on } E = -4$

$A \text{ on } D = -3$	$A \text{ on } C = -4$
$A \text{ on } E = -4$	$A \text{ on } F = -3$
$A \text{ on } H = -3$	

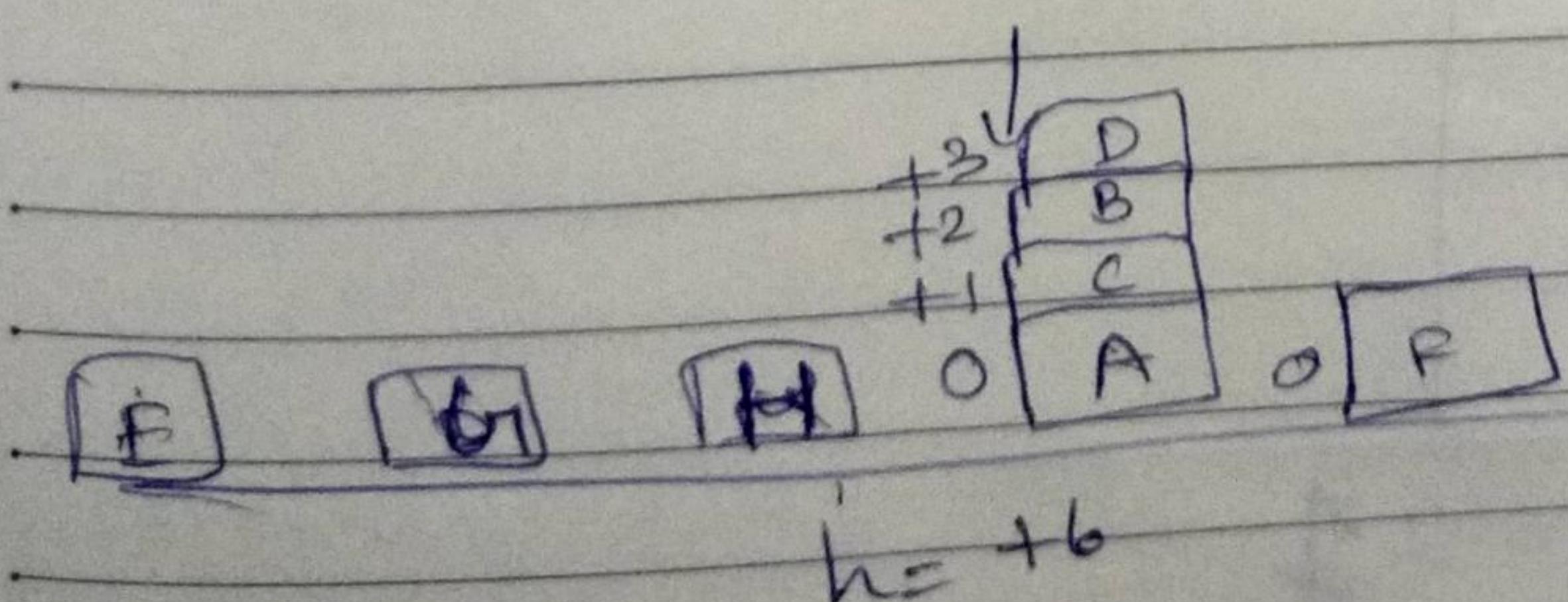
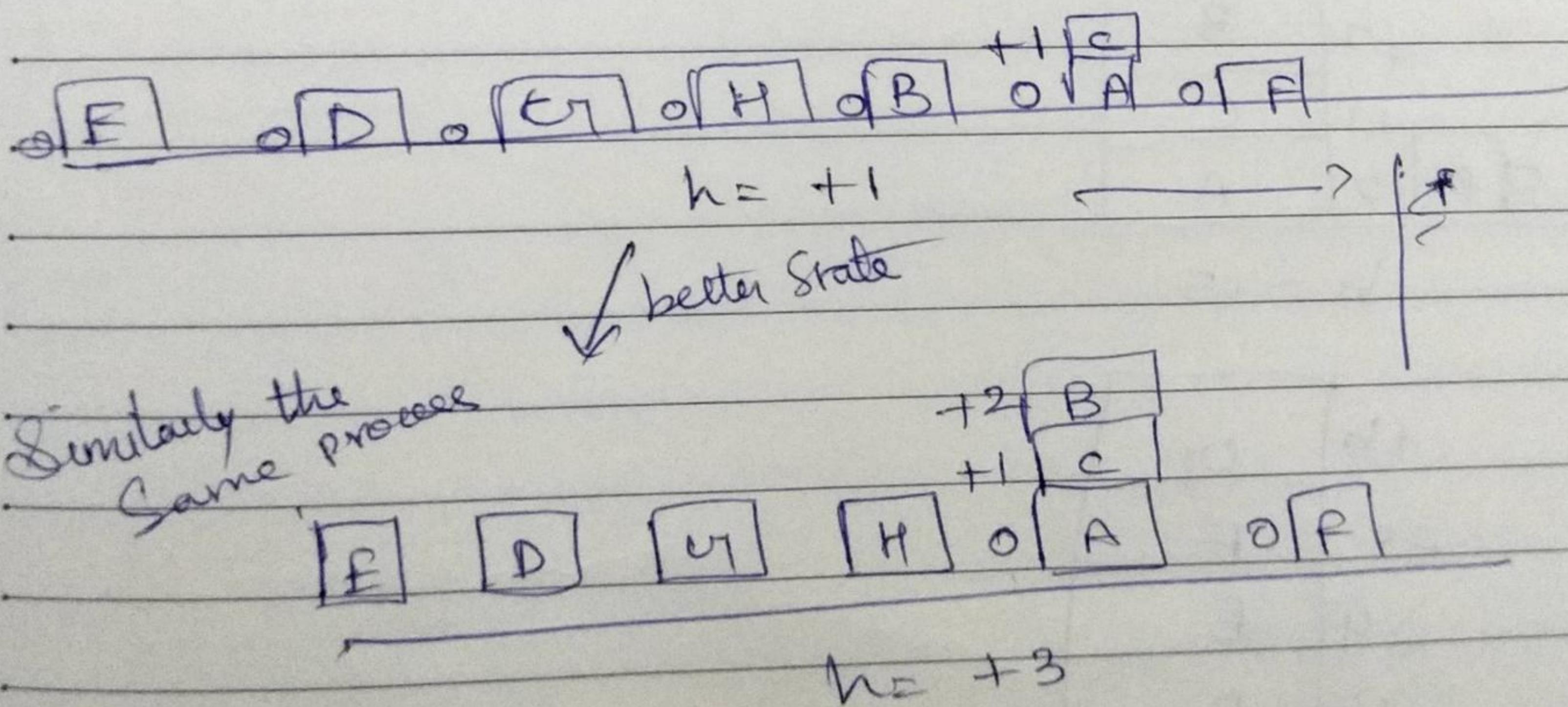
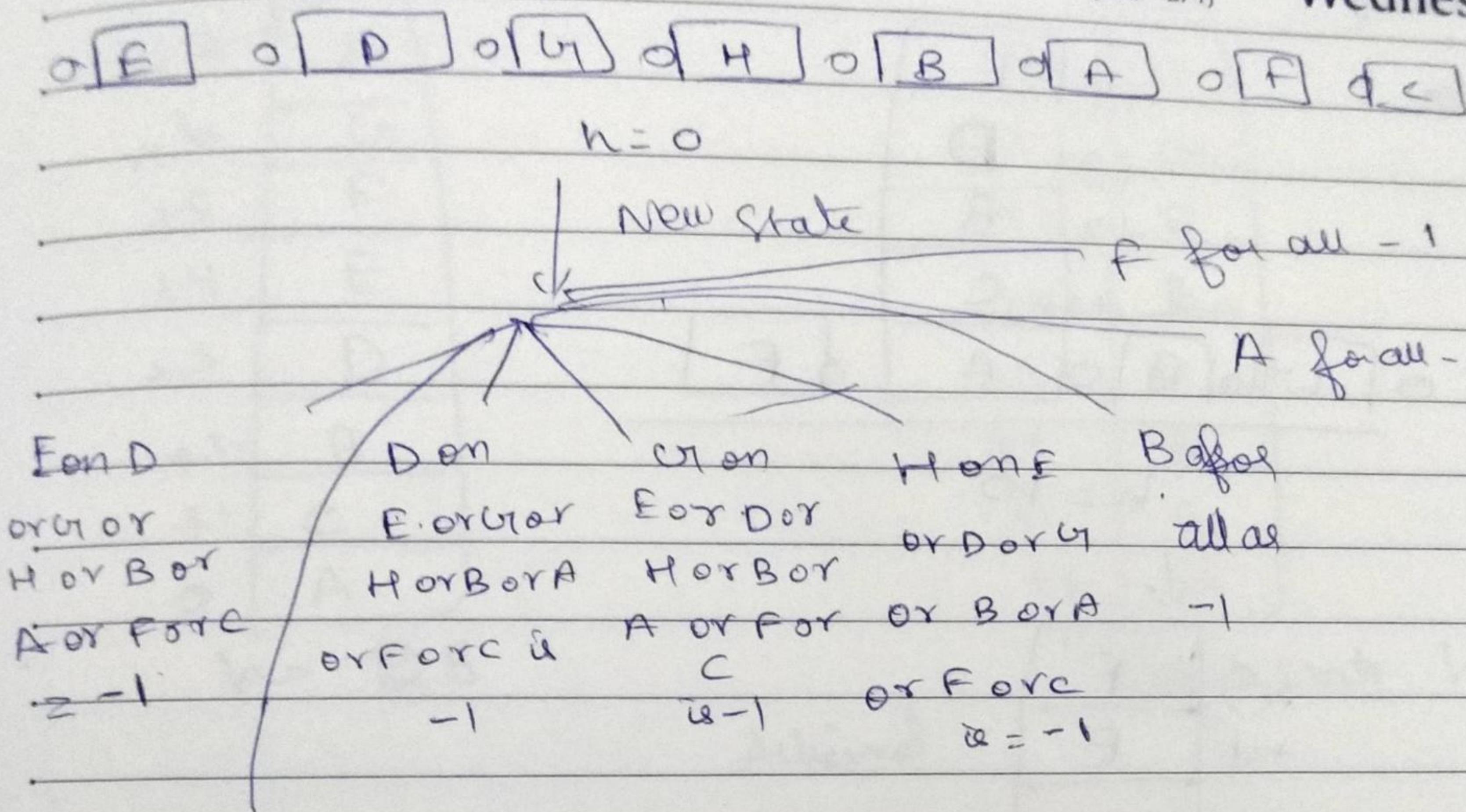
$$F \text{ on } D = -3$$

$$F \text{ on } E = -4$$

$$F \text{ on } H = -3$$

$$F \text{ on } C = -4$$

$$F \text{ on } A = -3$$

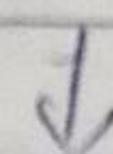


(093 - 273)

F-G

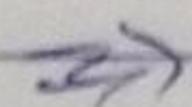
+4	F
+3	D
+2	B
+1	C

o [U] o [H] o A d F

 $n = 10.$ 

+5	F
+4	E
+3	D
+2	B
+1	C

o [U] o [H] o A

 $n = 15$

+6	U
+5	F
+4	E
+3	D
+2	B
+1	C

o [H] o A

 $n = 24$

Week 14

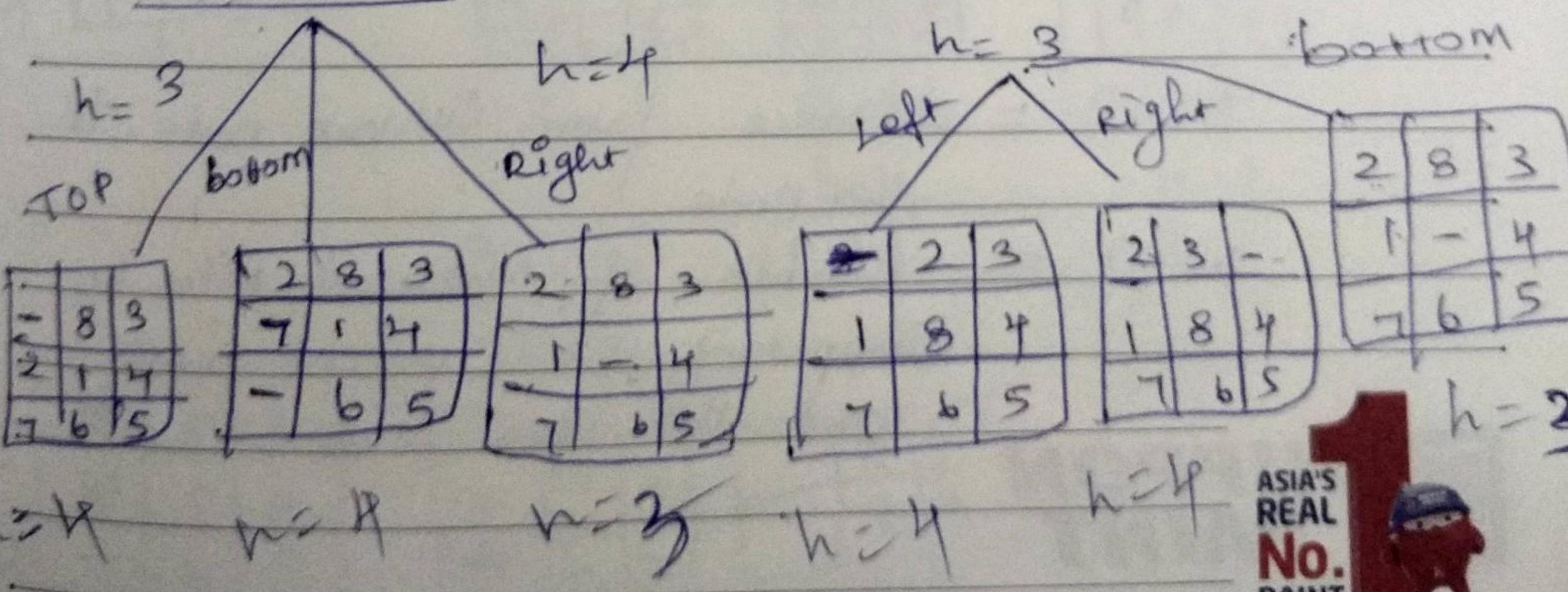
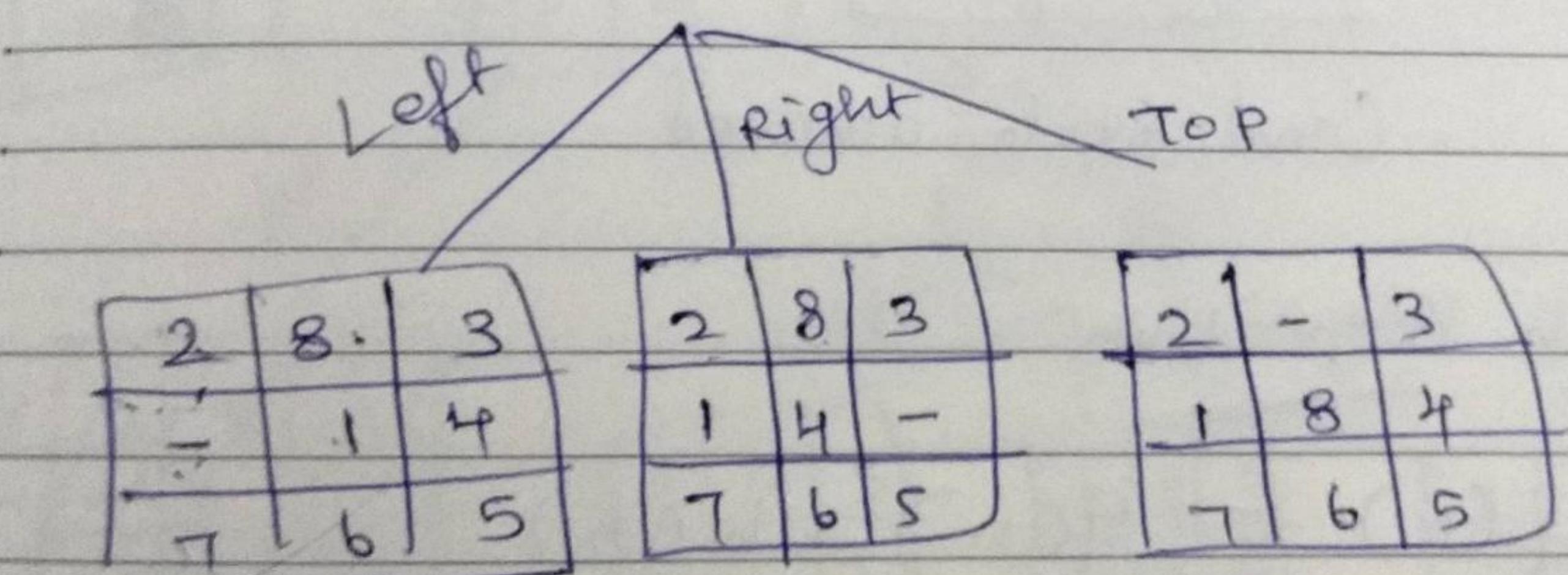
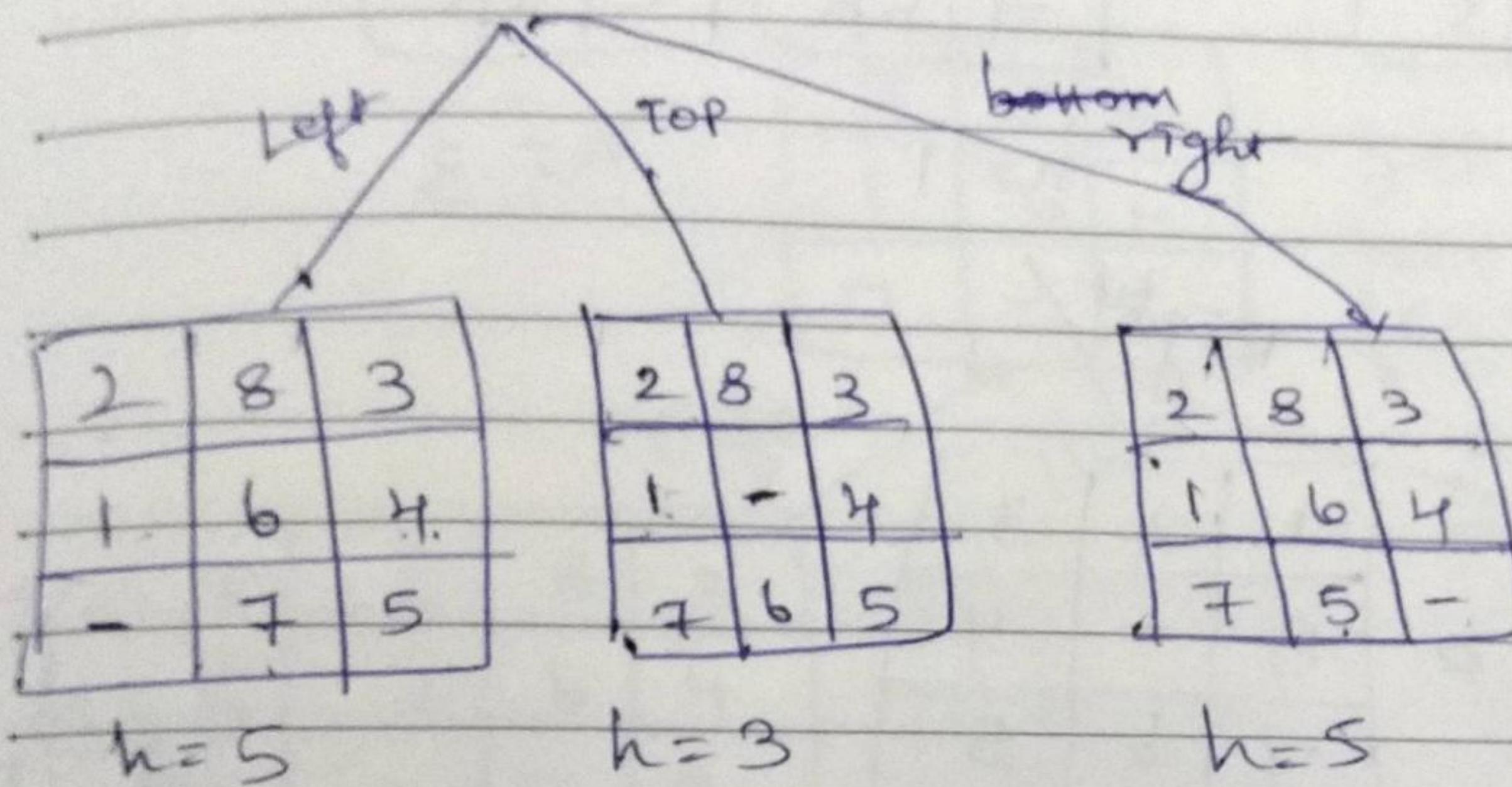
O	(094 - 272)	Friday
+7 H	+7 H	
+6 G	+6 G	
+5 F	+5 F	
+4 E	+4 E	
+3 D	+3 D	
+2 B	+2 B	
+1 C	+1 C	
0 A	10 A	Cross state h = 28
w = 28	Achieved	

2) Initial State

2	8	3
1	6	4
-	7	5

Goal State

1	2	3
8	-	4
7	6	5



ASIA'S
REAL
No.
PAINT



Tuesday

(070 - 200)

Week 15

Karume Day [Tanzania]

$h=4$

right

bottom

8	-	3
2	1	4
7	6	5

2	8	3
-	1	4
7	6	5

$h=3$

$h=3$

$h=4$

bottom

right

1	2	3
-	8	4
7	6	5

2	-	3
1	8	4
7	6	5

$h=1$

$h=3$

right

1	2	3
8	-	4
7	6	5

Goal State achieved

A* Search Algorithm

$$f(n) = g(n) + h(n)$$

$g(n)$ = distance from current node to root node

$h(n)$ = number of misplaced tiles by comparing the current state and the goal state



NIPPON

Initial

2	8	3
1	6	4
7	-	5

1	2	3
8	-	1
7	6	5

2	8	3
1	6	4
7	-	5

$$g(n) = 0$$

$$h(n) = 4$$

$$f(n) = 4$$

Left TOP Right

$g(n) = 1$	2 8 3	2 8 3	2 8 3	$g = 1$
$h = 5$	1 6 4	1 - 4	1 6 4	$h = 15$
$f = 6$	- 7 5	7 6 5	7 5 -	$f = 15$

UP

Left Right TOP

$g=2$	2 8 3	2 8 3	2 - 3
$h=2$	- 6 4	1 4	1 8 4
$f=4$	1 7 5	7 6 5	7 6 5

$$g=2$$

$$h=3$$

$$F=5$$

$$g=2$$

$$h=4$$

$$F=6$$

$$h=3$$

$$g=2$$

$$F=5$$

up down left right

$g=3$	2 8 3	2 8 3	2 3 -
$h=3$	2 1 4	1 4	1 8 4
$f=6$	7 6 5	7 6 5	7 6 5

$$g=3$$

$$h=3$$

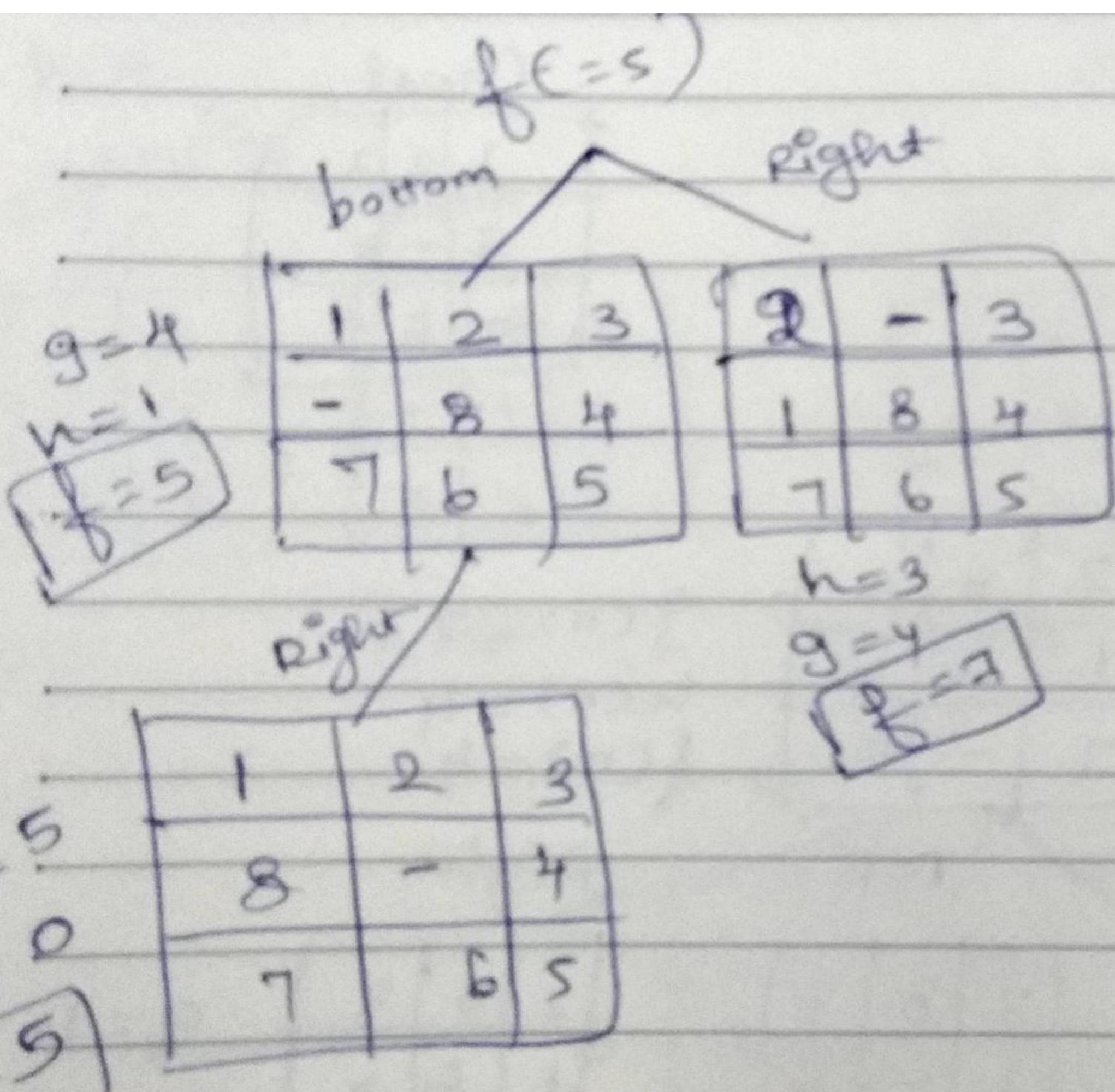
$$F=5$$

$$g=3$$

$$h=4$$

$$F=7$$

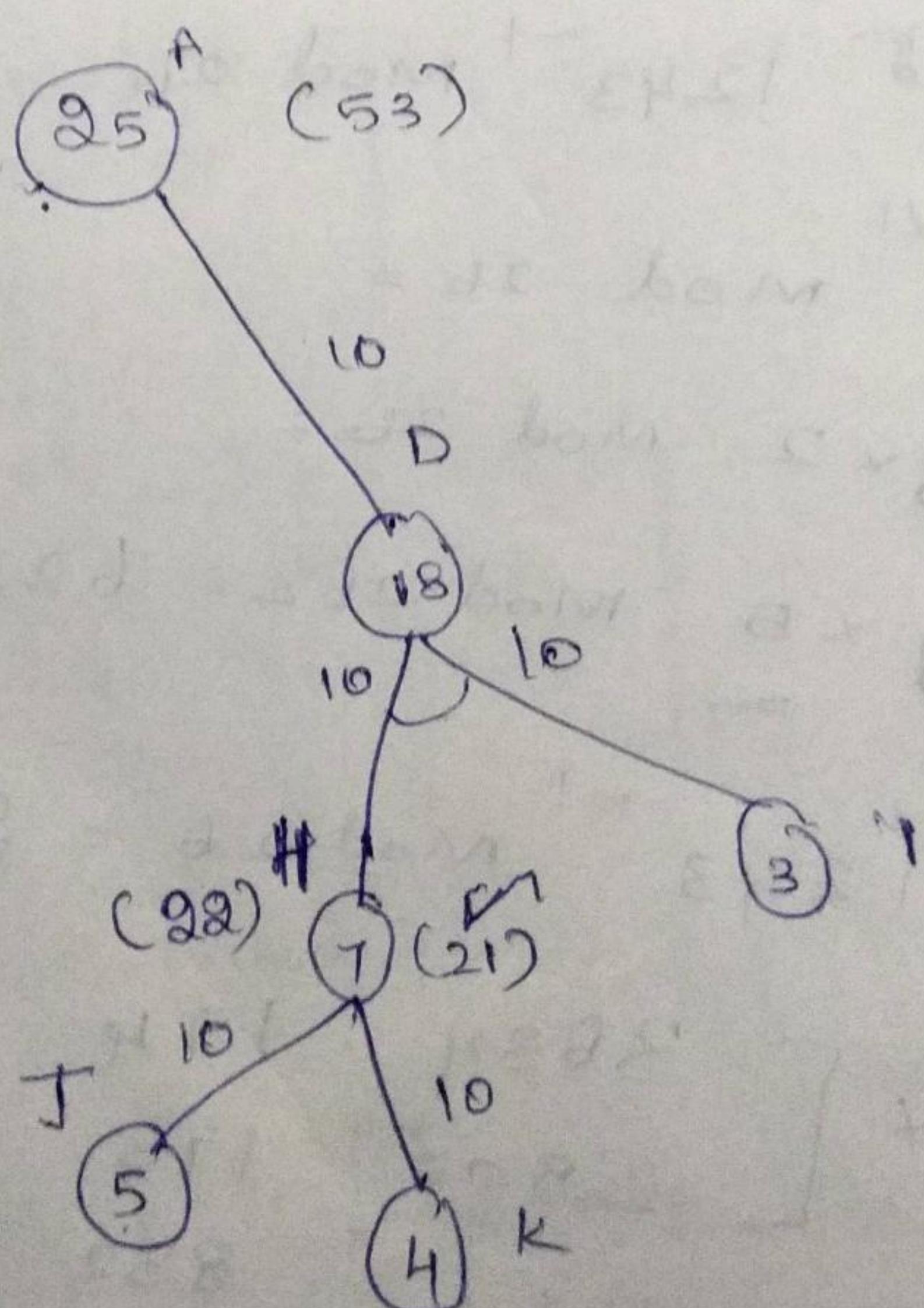
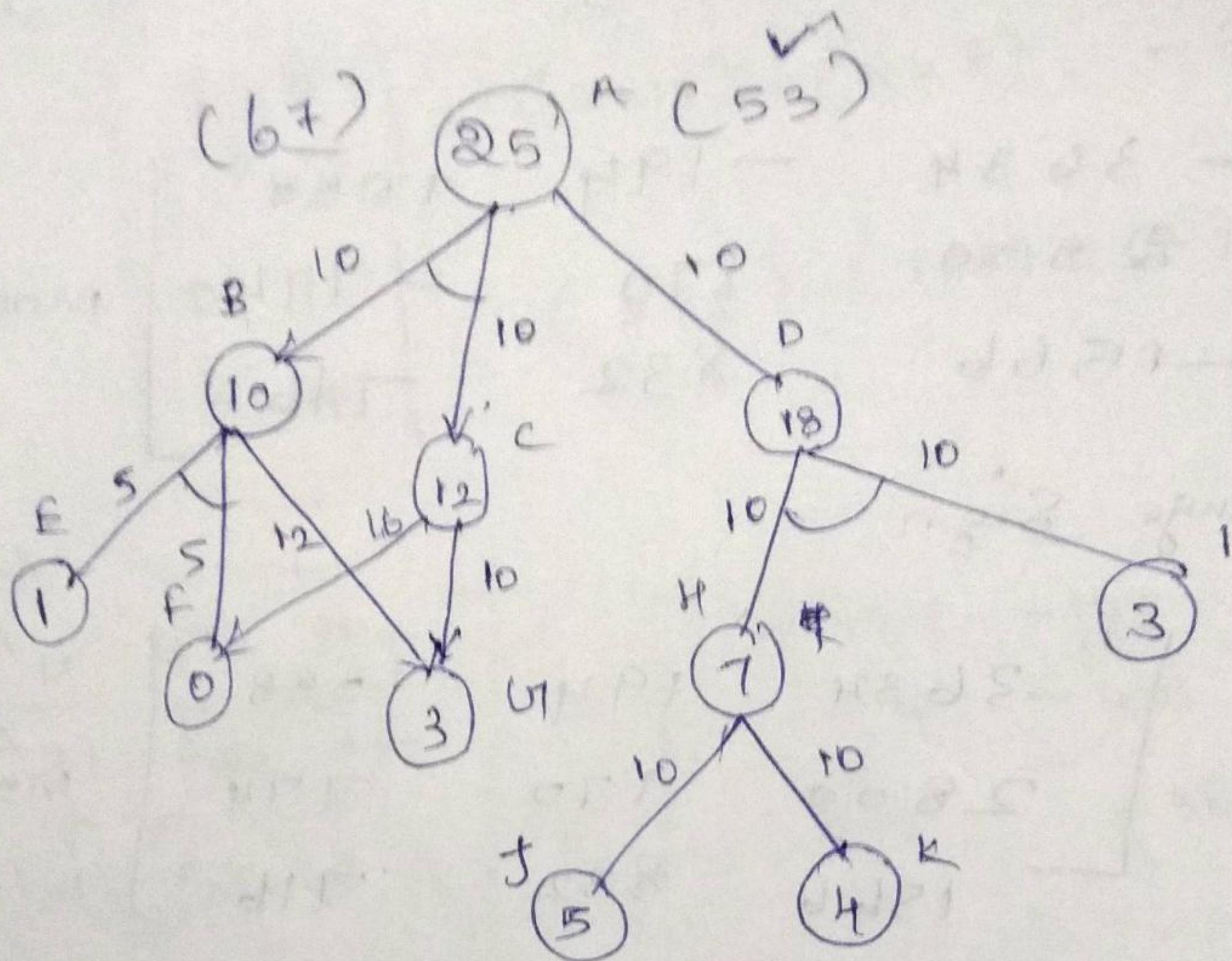




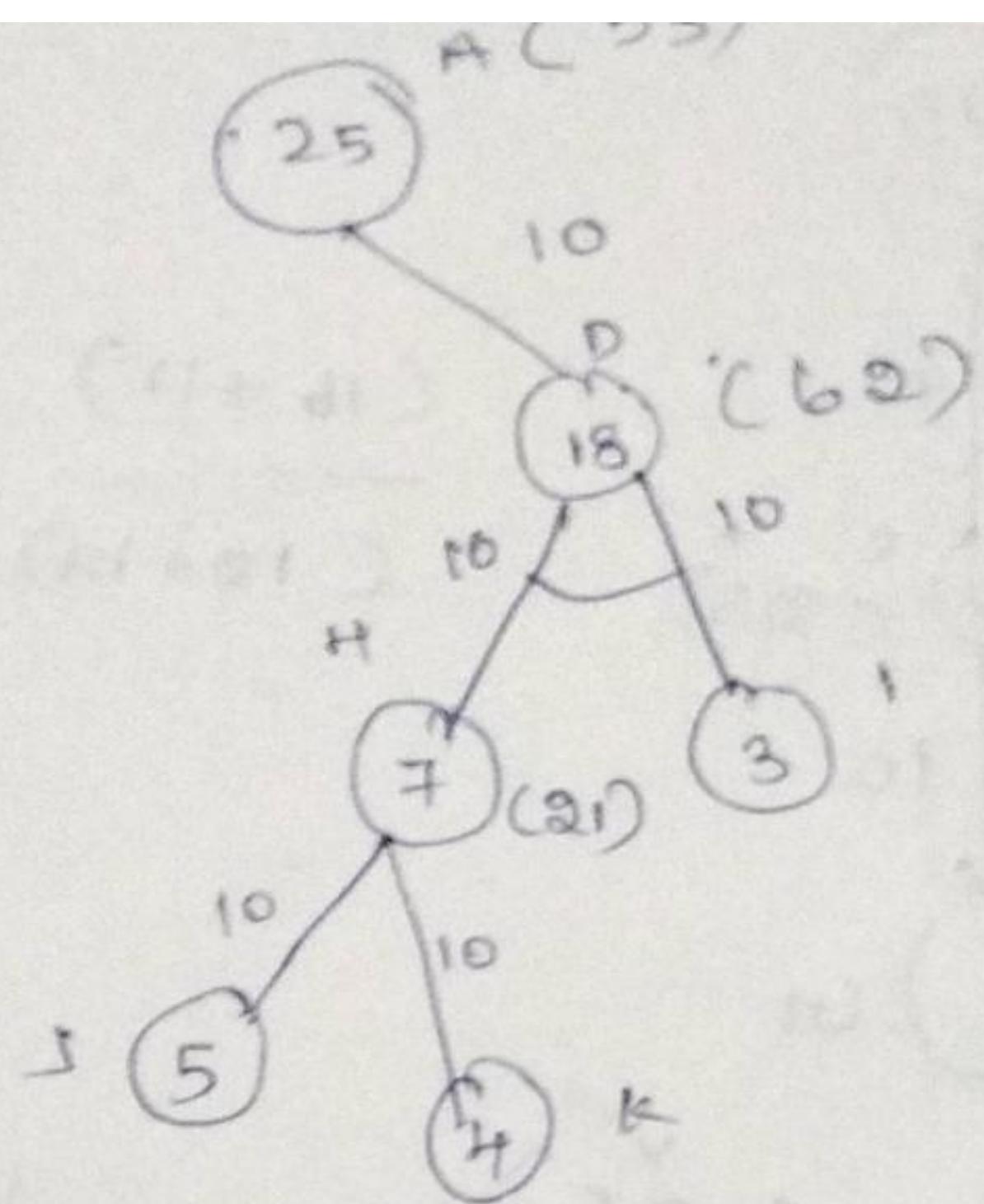
Goal State achieved at $f(n) = 5$

9.

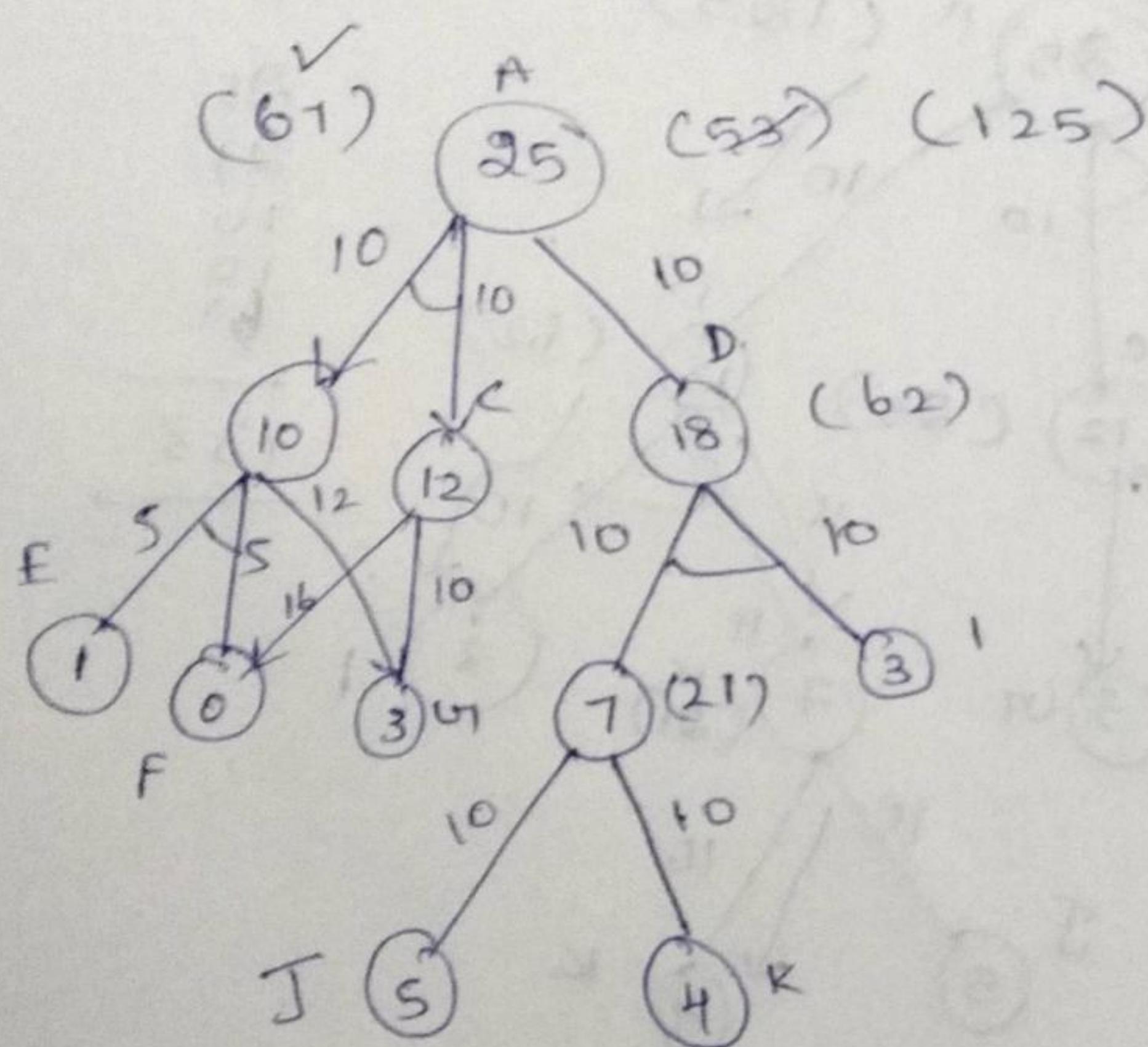
1.



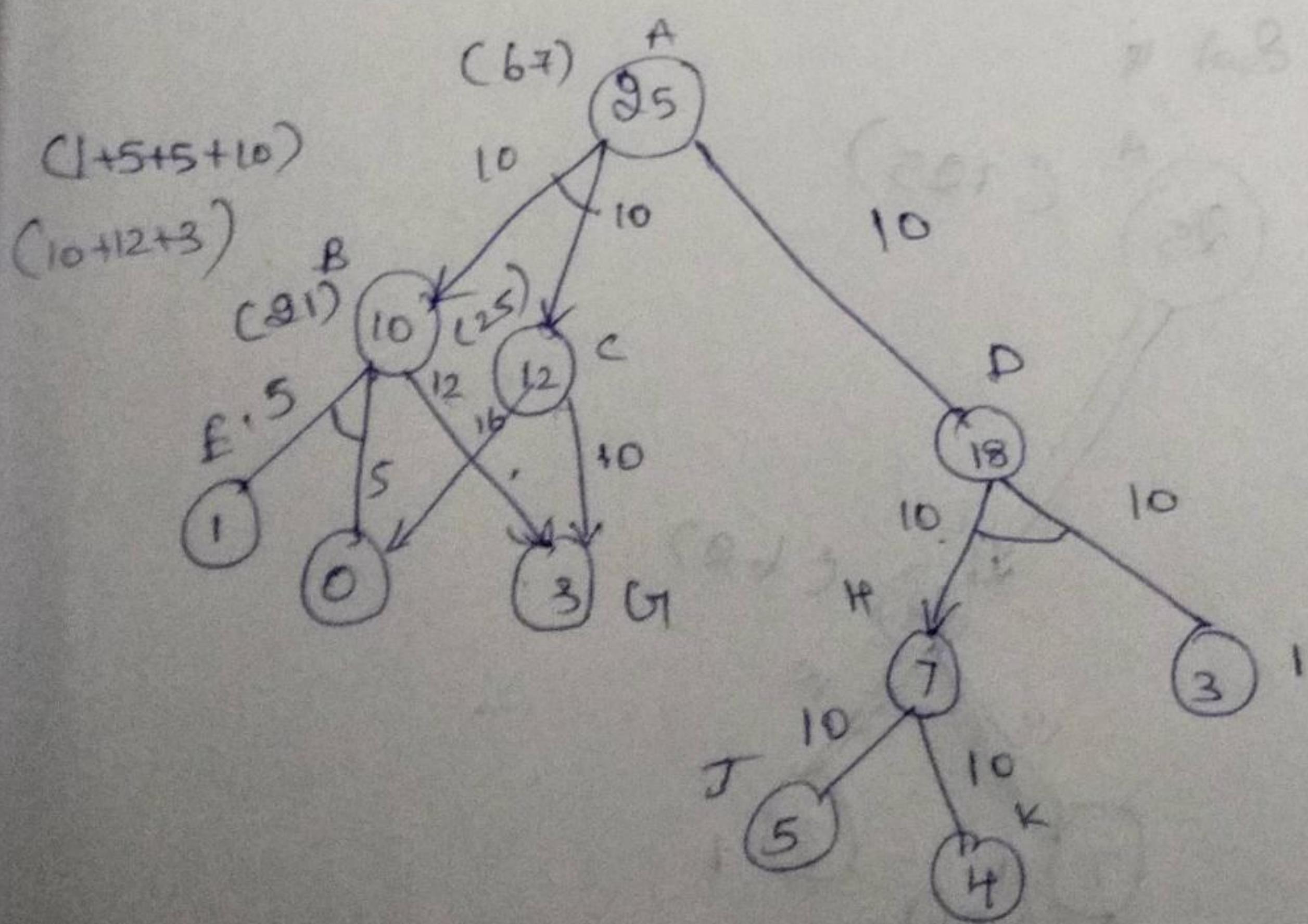
$$\begin{array}{r}
 15 \\
 + 14 \\
 \hline
 22
 \end{array}
 \quad
 \begin{array}{r}
 7 \\
 + 7 \\
 \hline
 14
 \end{array}
 \quad
 \begin{array}{r}
 22 \\
 - 21 \\
 \hline
 1
 \end{array}$$

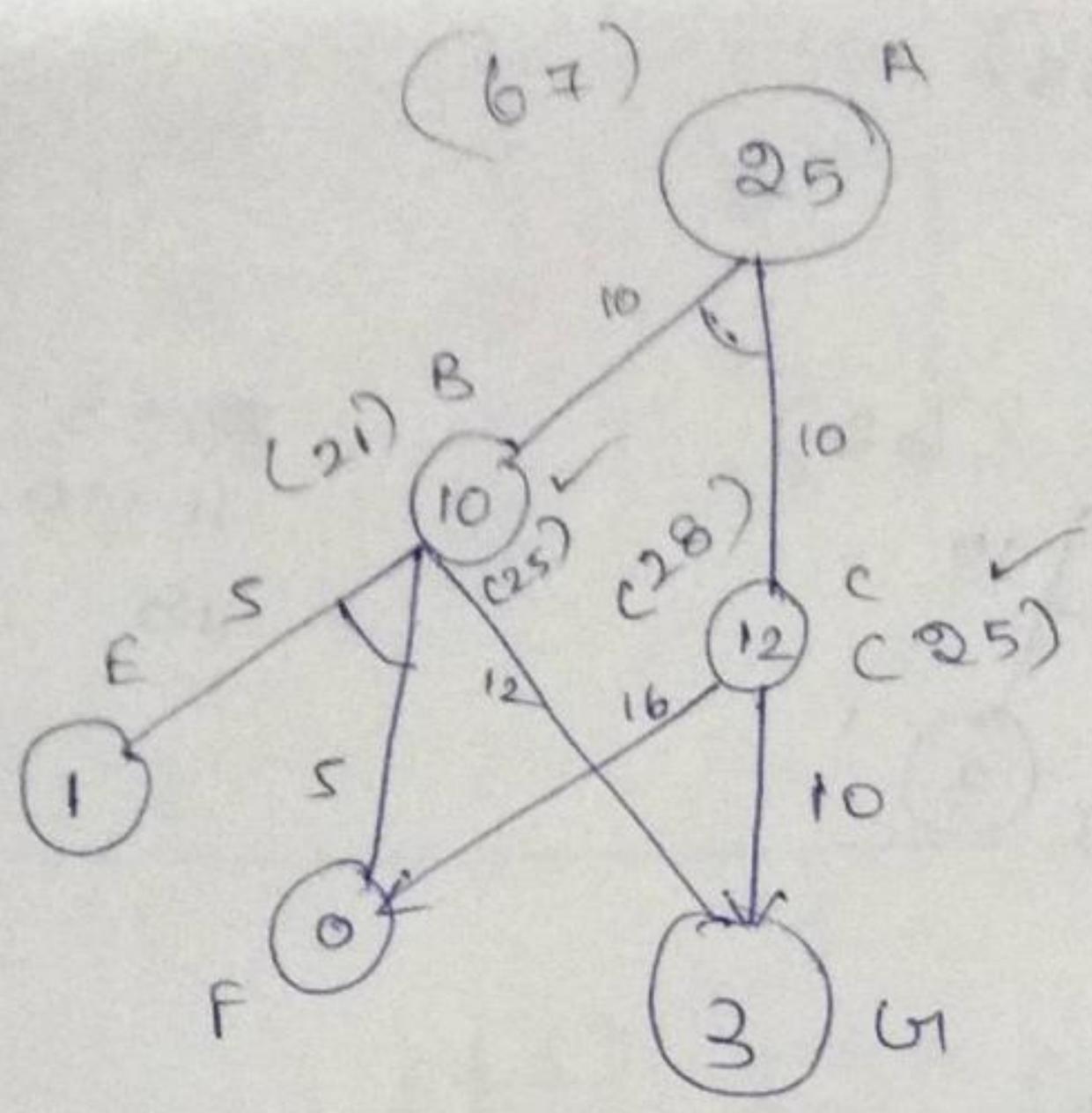


$$\begin{aligned}
 21+3 &= 24 \\
 10+10 &= 20 \\
 18 &= 18 \\
 \hline
 & 62
 \end{aligned}$$

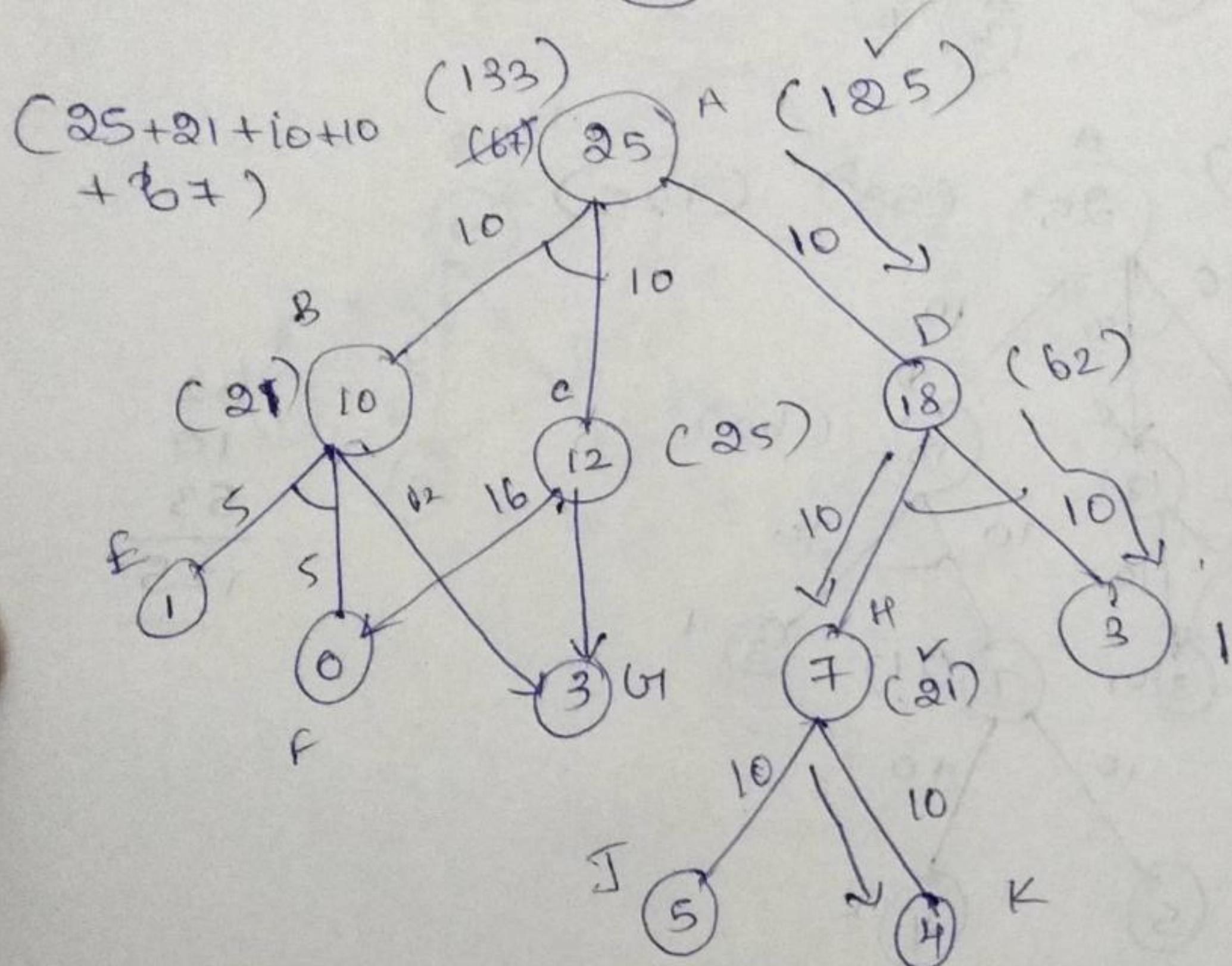


$$\begin{array}{r}
 62 \\
 10 \\
 53 \\
 \hline
 125
 \end{array}$$



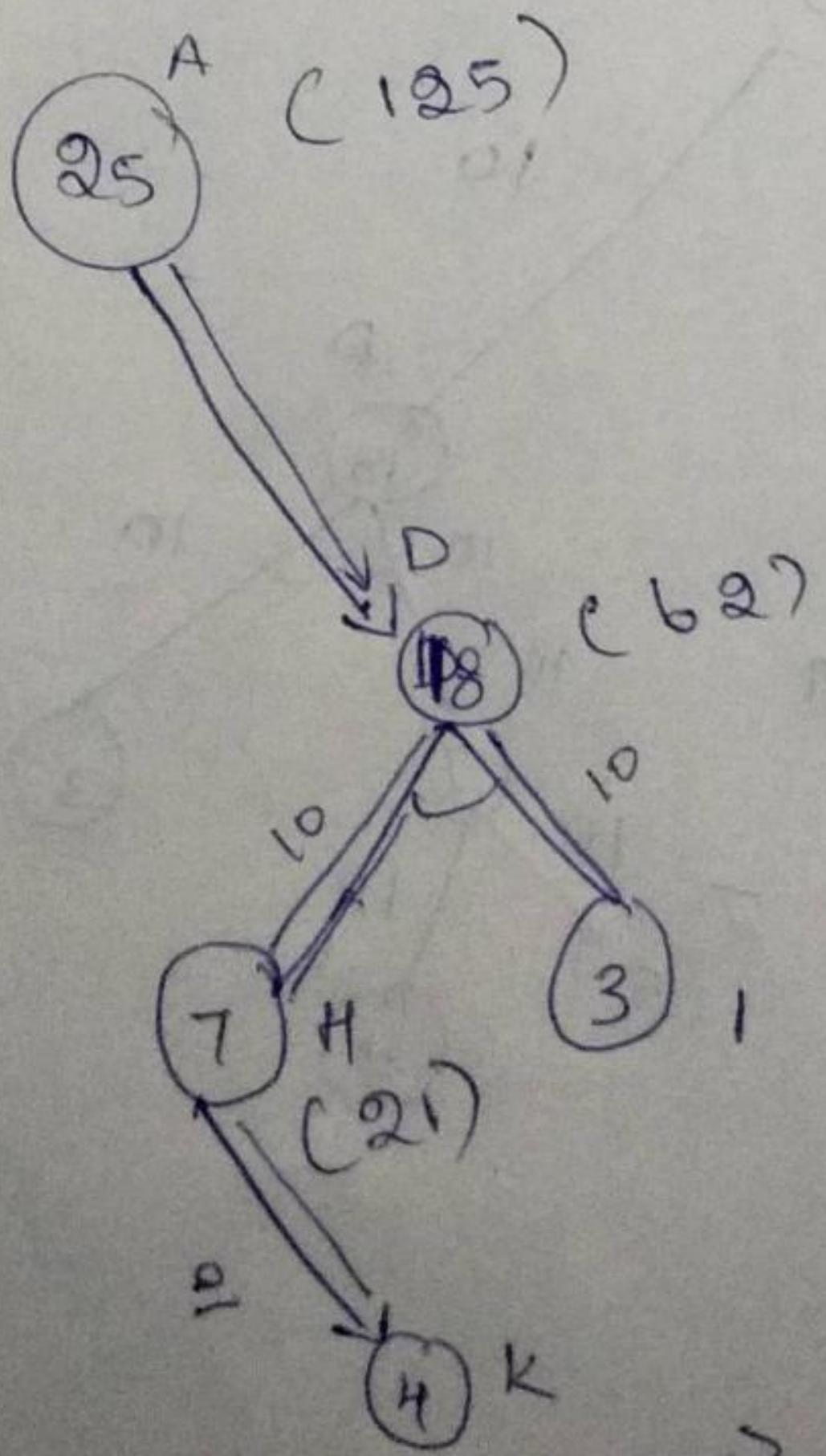


$$\frac{(16+12)}{(12+13)} = 25$$



$$\begin{array}{r} 1 \\ 25 \\ 21 \\ 10 \\ \hline 67 \\ 10 \\ \hline 133 \end{array}$$

Therefore the Sol is



→ Global State achieved

1) $C_5 C_4 C_3 C_2 C_1$
 C R O A D S
 + R O A D S
D A N U E R

$C_5 <^D_1$

$$C_5 = 1 \Rightarrow [D \Rightarrow 1]$$

Since $S + S = R \Rightarrow S$ will be even
 number will be present

for R

$$\text{For } R \Rightarrow 4 \quad S \Rightarrow 2$$

$$S + S = R$$

$2 + 2 = 4 \Rightarrow$ if taken R as 4

$$C_{10} + C + R = A + 10$$

$$1 + C + 4 = A + 10$$

$$C + 4 = A + 10 \Rightarrow C = A + 6$$

So $C \geq b$

if $C = 9$, we get conflict happens

$$(A, E) \Rightarrow 3$$

1	C_9	R_4	6	S_2	E_2
+	R_4	0	A	D1	S2
	b1	3	n	u	E3
	b1	3	n	u	R4
	↓ conflict				

So take R as 6

If $R \Rightarrow b$ $S \Rightarrow 3$ then $C = 9$

O	$R 9$	$R b$	b	$S 3$	$S 3$
$+ 4$	$R b$	b	$A 5$	$D 1$	$S 3$
	$D 1$	$A 5$	N	G	$R b$

F

$$R + O = N$$

$$b + \textcircled{O} = N \Rightarrow \begin{matrix} b+1 \\ 1 \downarrow \\ \text{already } 0 \end{matrix}, \begin{matrix} b+2 \\ \downarrow \\ b+3 \end{matrix}$$

I	$+ 4$	O	$\overbrace{\quad \quad \quad \quad \quad \quad}^D$		
		$c 9$	$R b$	$b 2$	$S 3$
		$R b$	$0 2$	$A 5$	$D 1$
	$\underline{+}$	$D 1$	$A 5$	$N 8$	$R b$

$$A = 5$$

$$C = 9$$

$$D = 1.$$

$$E = 4$$

$$G = 7$$

$$R = 6$$

$$O = 2$$

$$N = 8$$

$$S = 3.$$

Hence

$$\begin{array}{r}
 & 9 & b & 2 & 3 & 3 \\
 & + b & 2 & 5 & 9 & 3 \\
 \hline
 & 1 & 5 & 8 & 7 & 4 & b
 \end{array}$$

Solving without
the carry