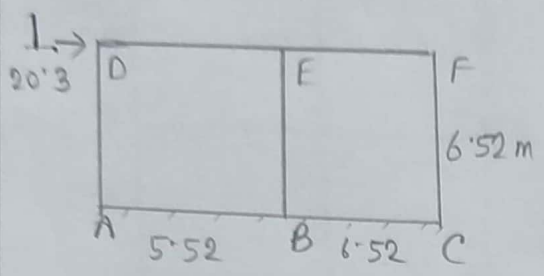


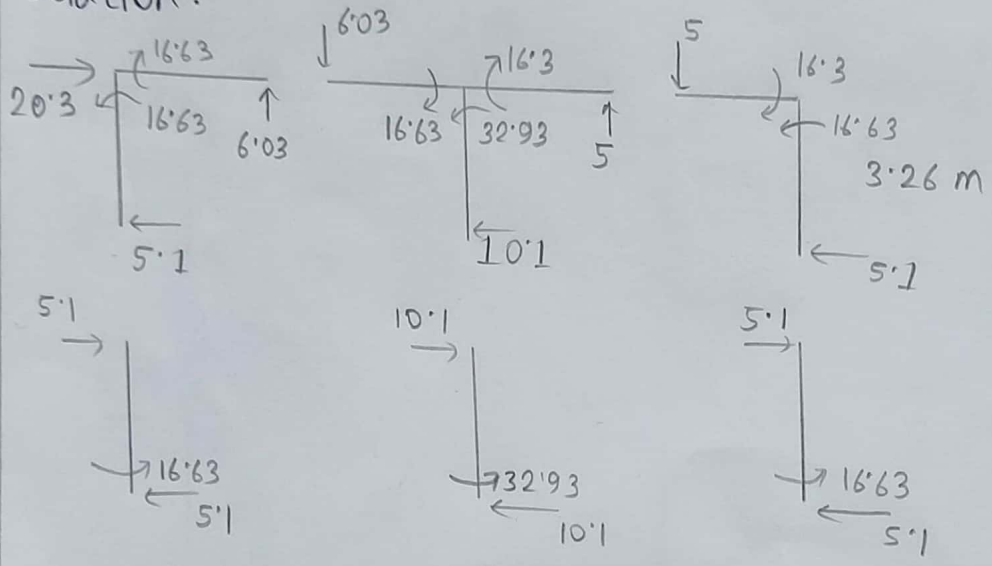

$P_1 = 14 + (\cdot 05 \times 126) = 20 \cdot 3$ kN.

$P_2 = \cdot 26 \cdot 3$ kN, $P_3 = P_4 = 16 \cdot 3$ kN

$h_1 = 6 \cdot 52$, $h_2 = h_3 = 5 \cdot 52 = b_1$

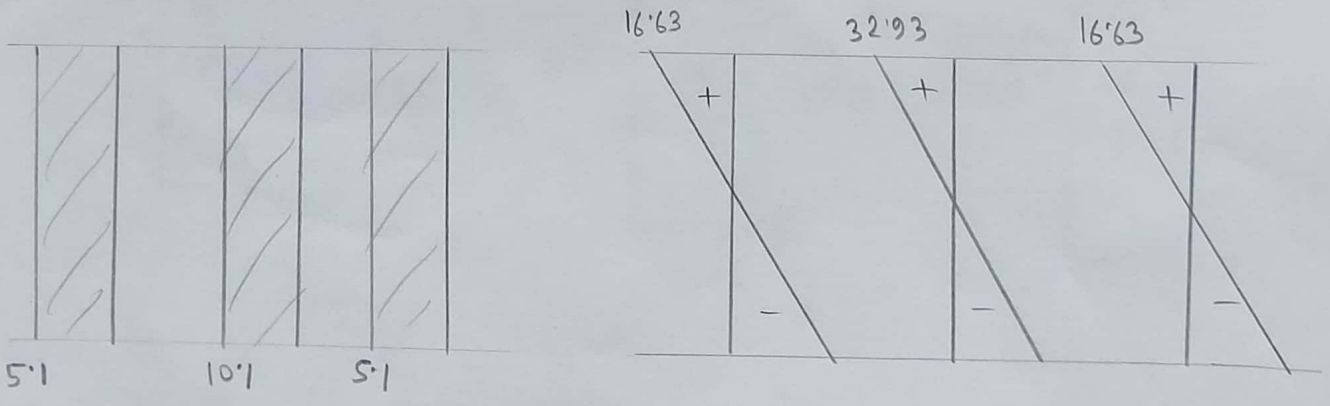
$b_2 = 6 \cdot 52$m

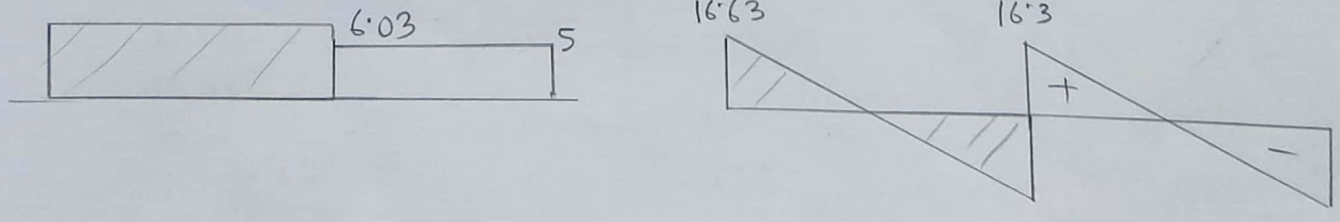
Solution:

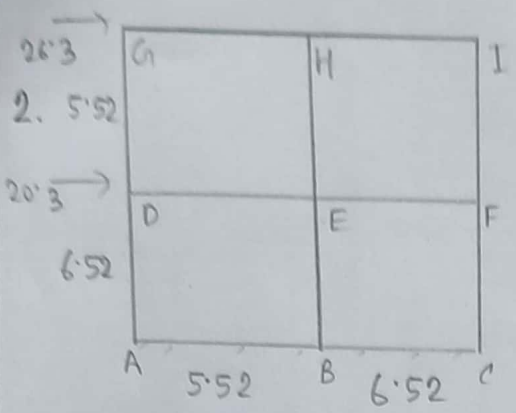






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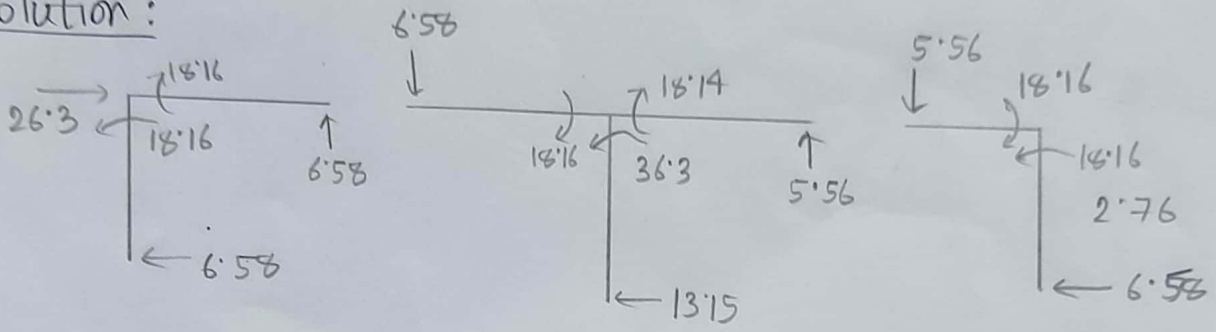
G
H
I
2. 5·52
20·3
D
E
F
6·52
A
5·52
B
6·52
C

Solution :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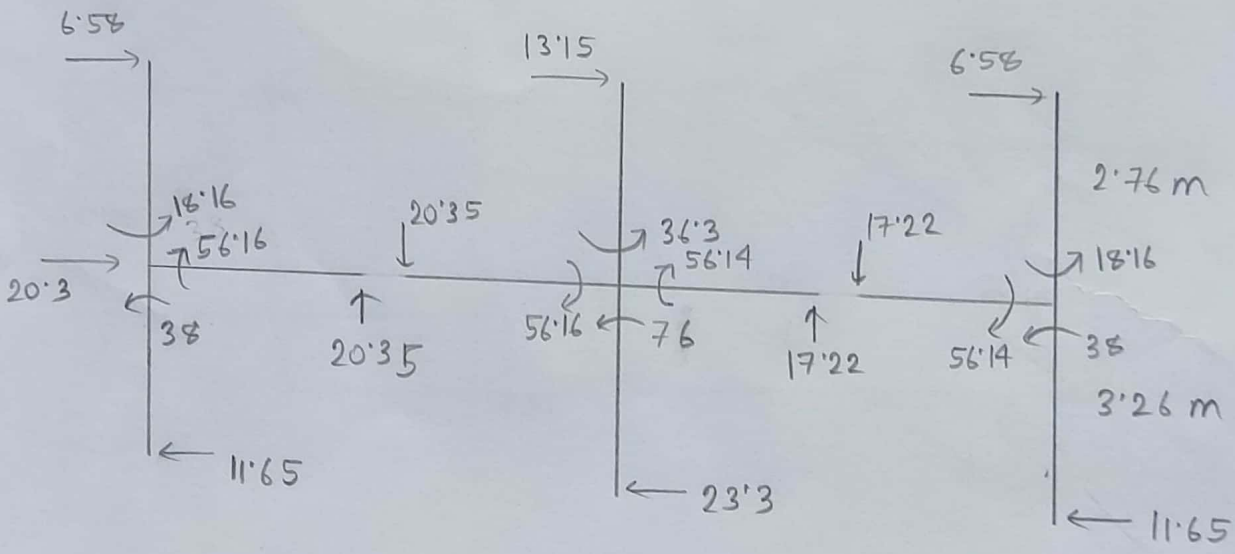
6·58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36·3
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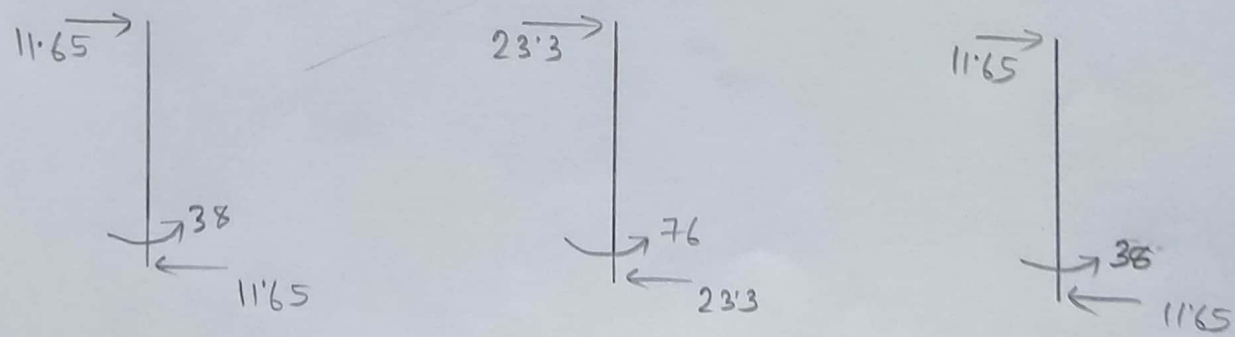
18·16
56·14
38
3·26 m
11·65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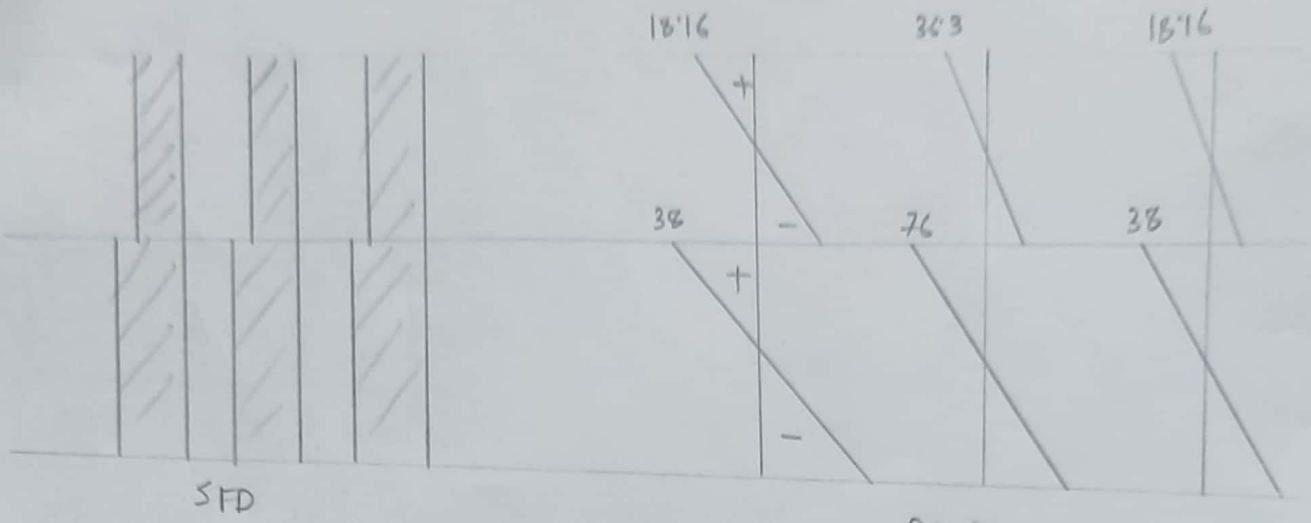
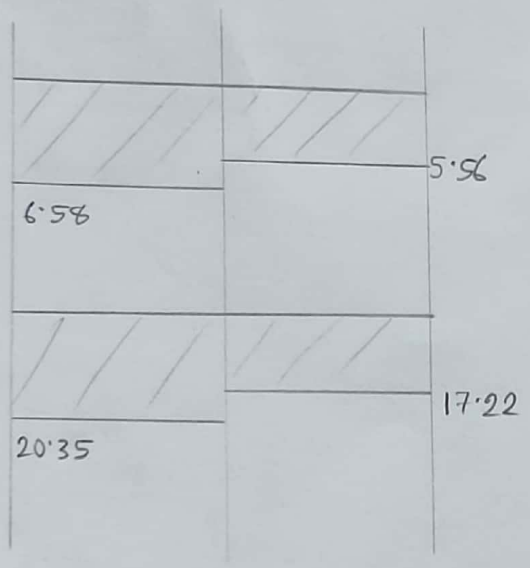



SFD

BMD

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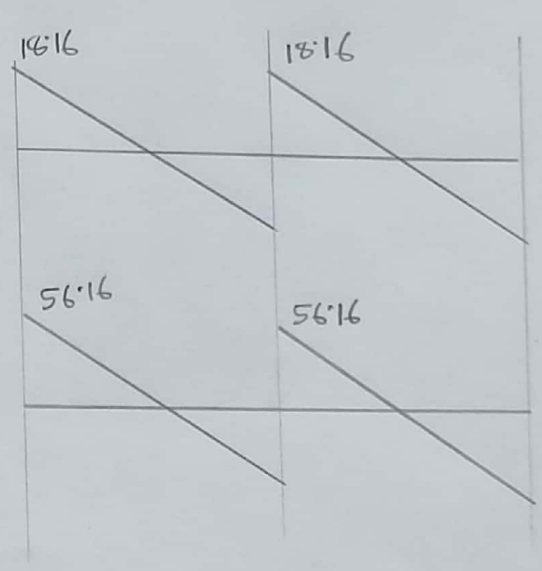


BMD

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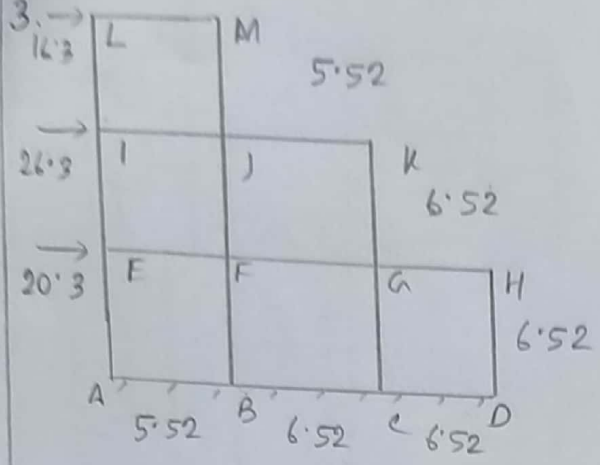
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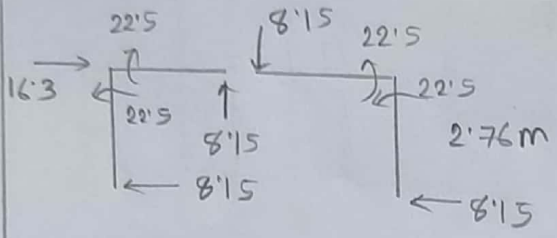
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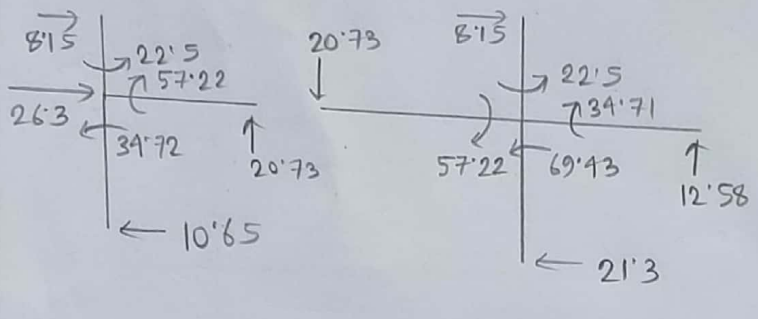
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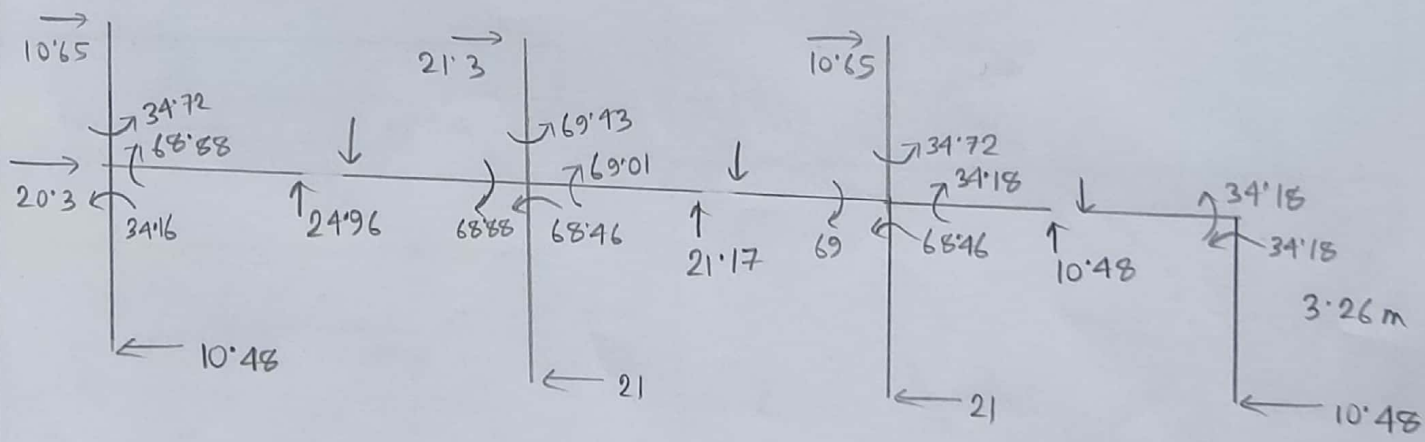
3·26m
10·65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3·26m
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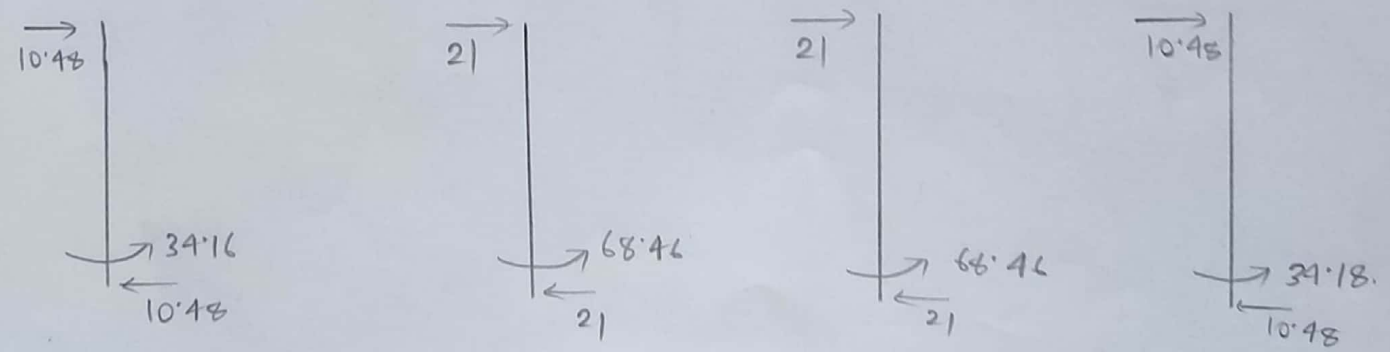
10·48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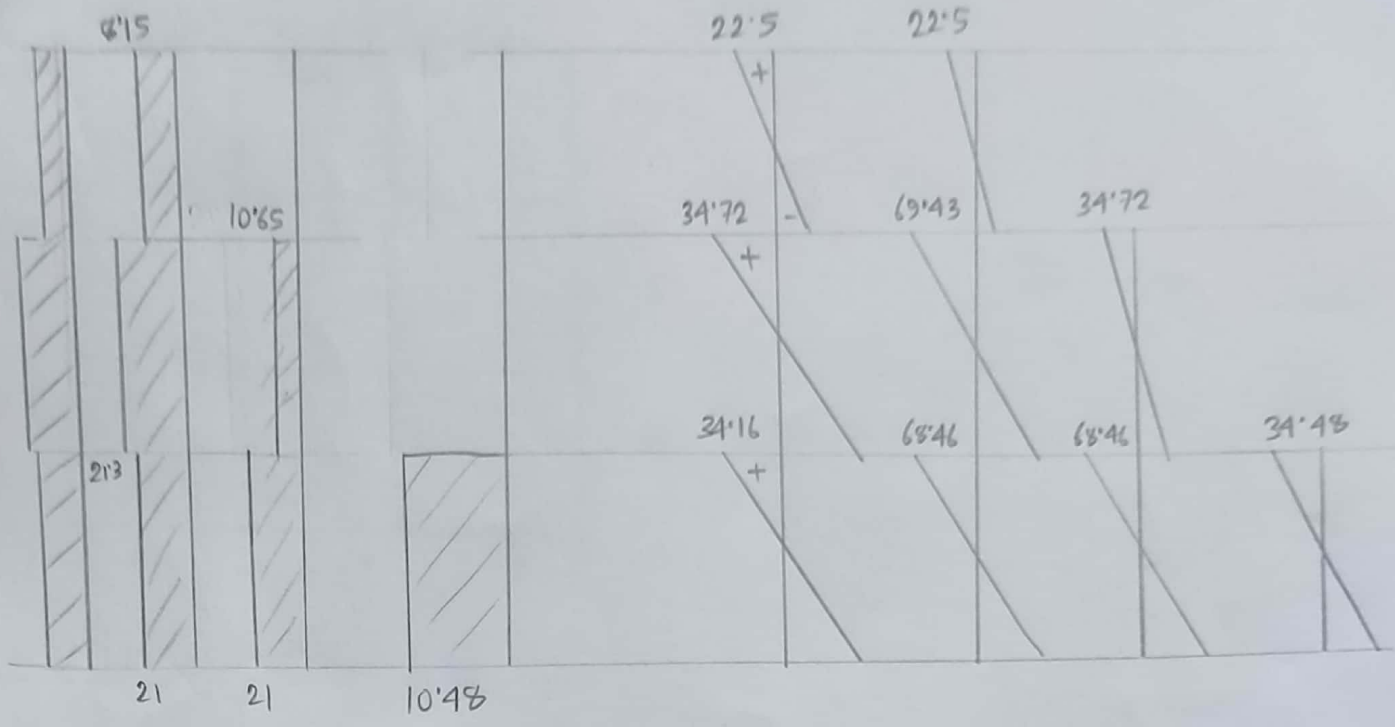
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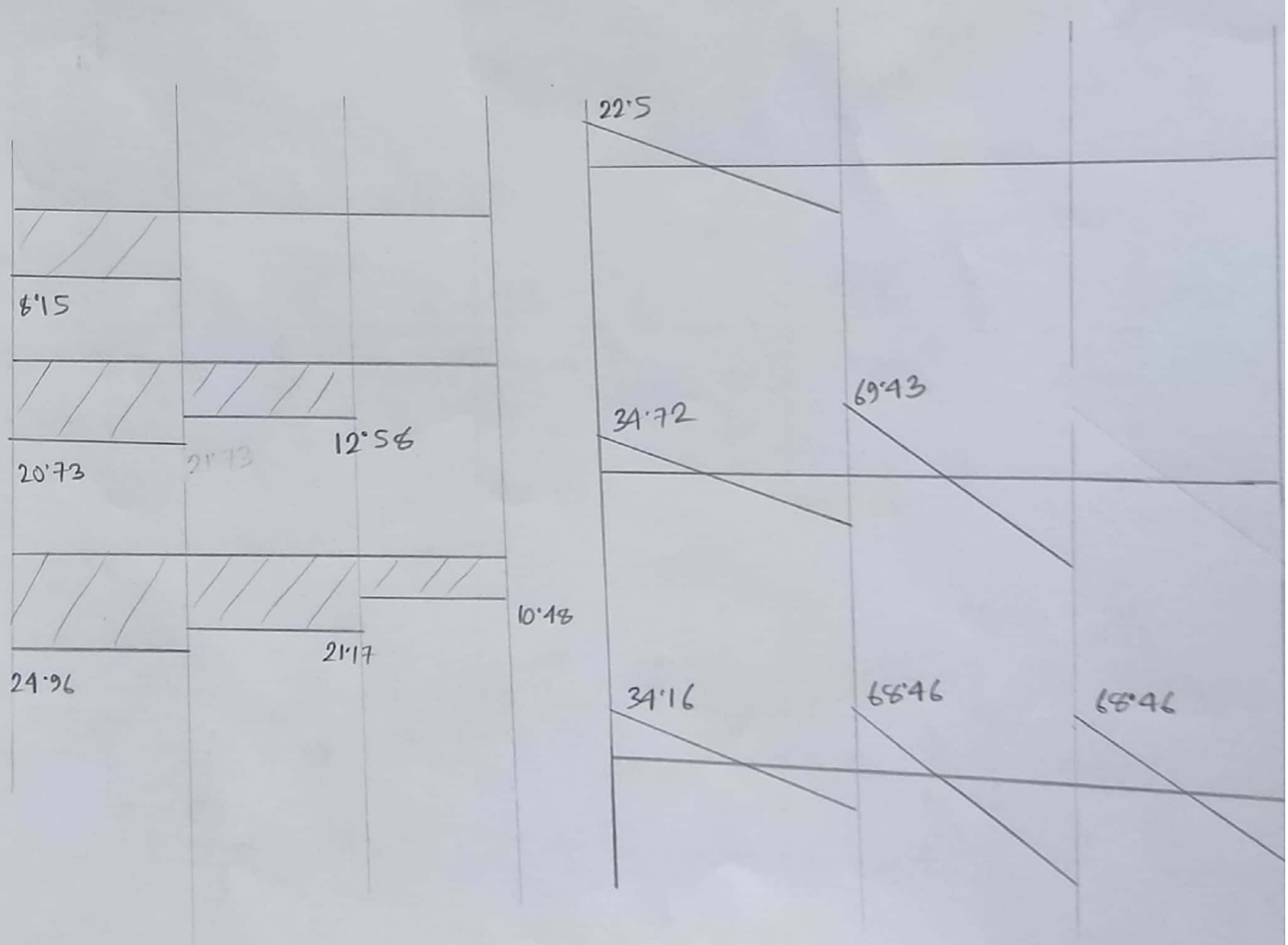
SFD BMD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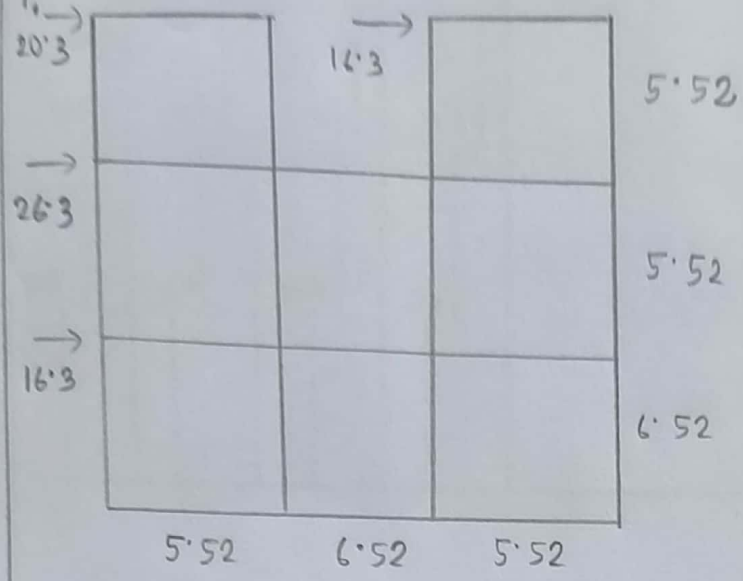
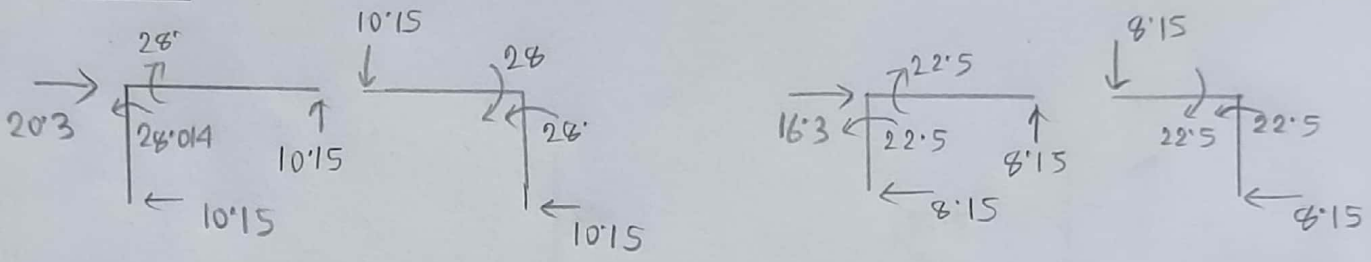
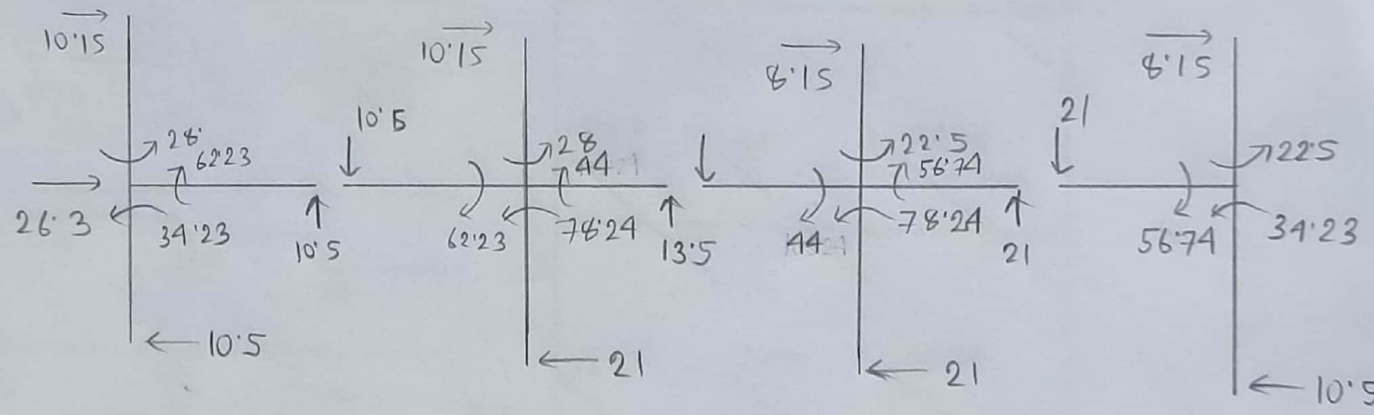


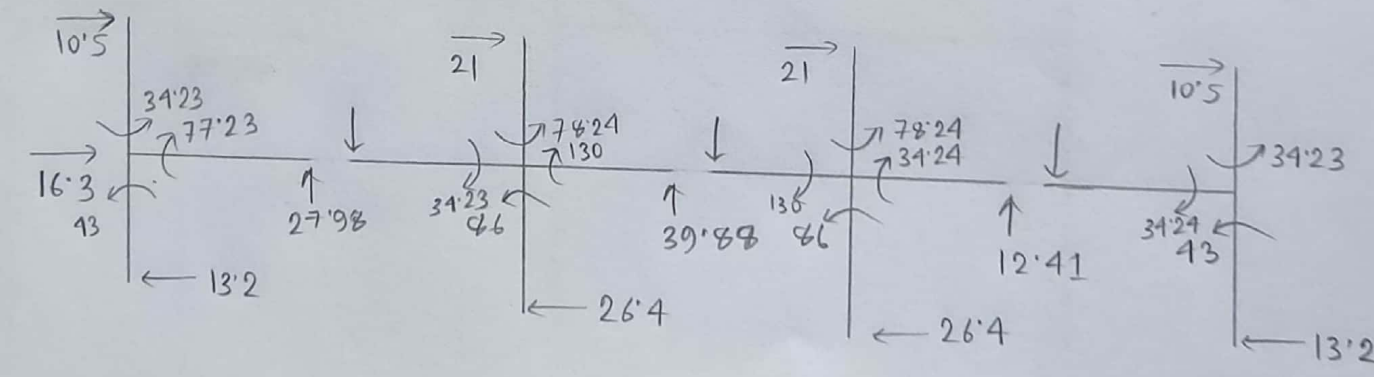

2·76

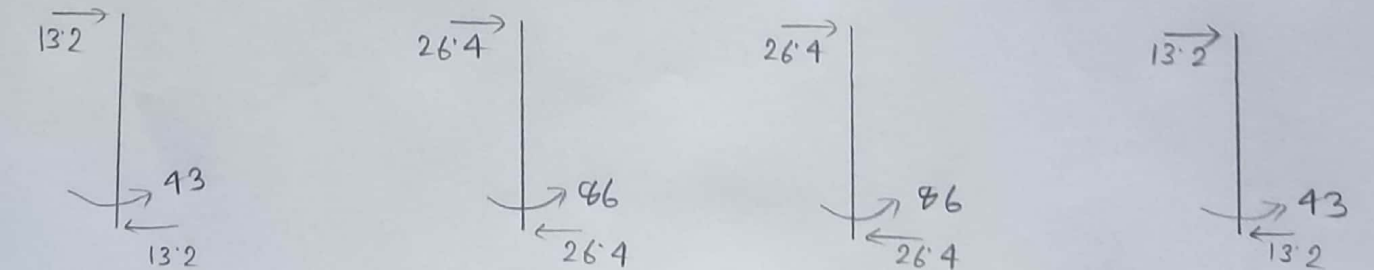
3·26

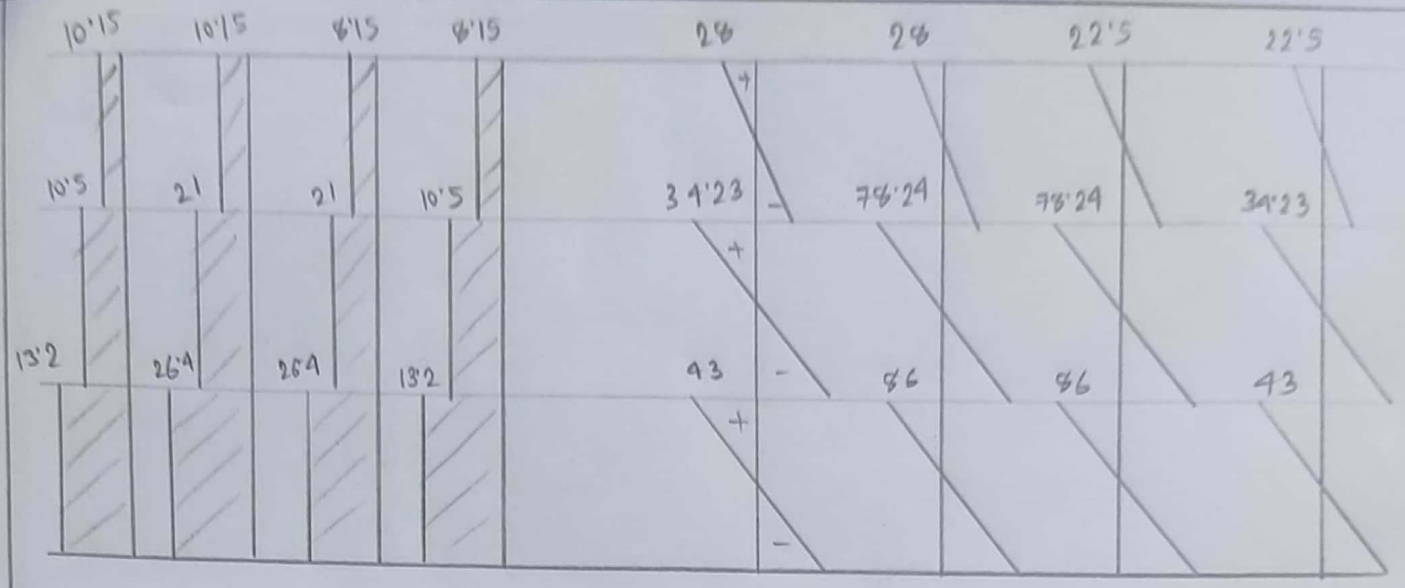
Solution:

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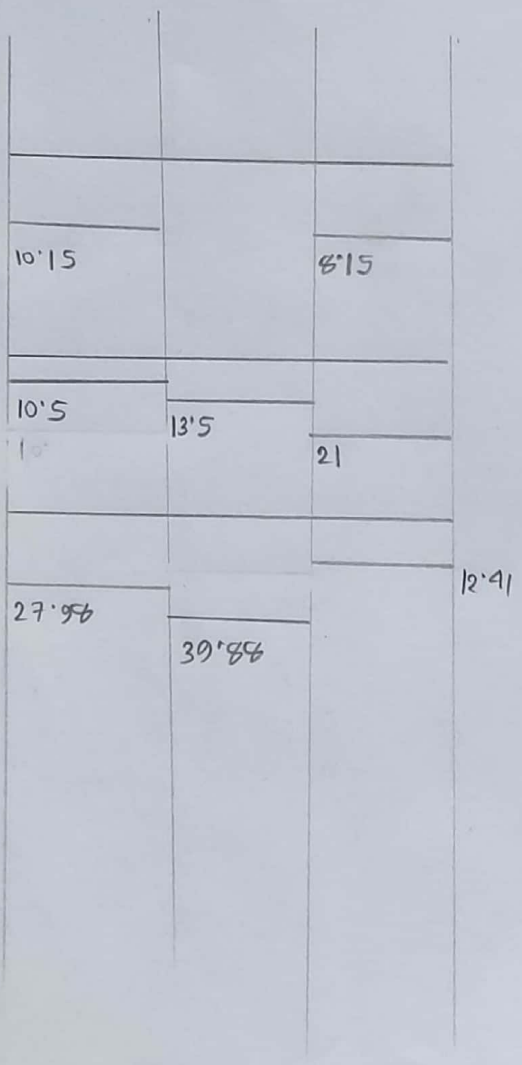
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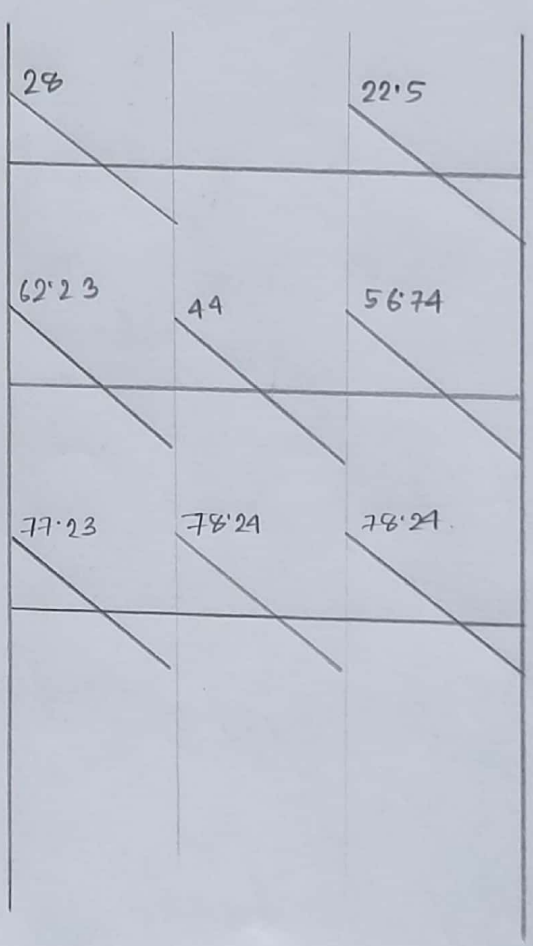
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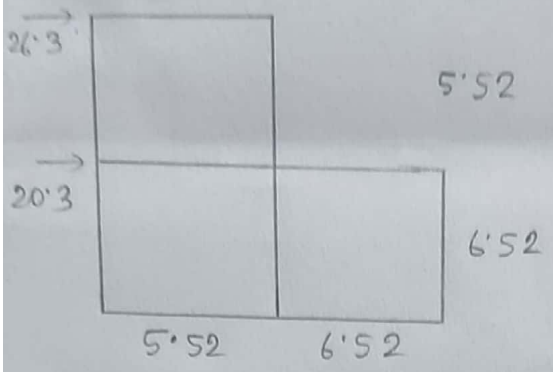
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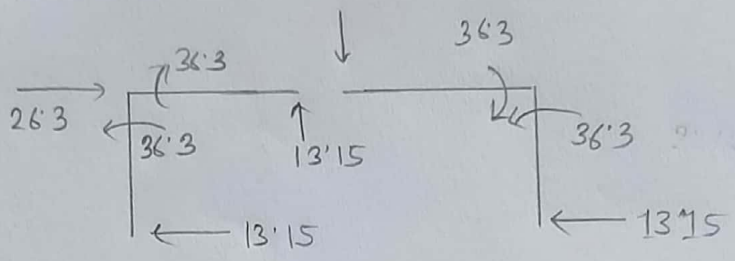
Solution: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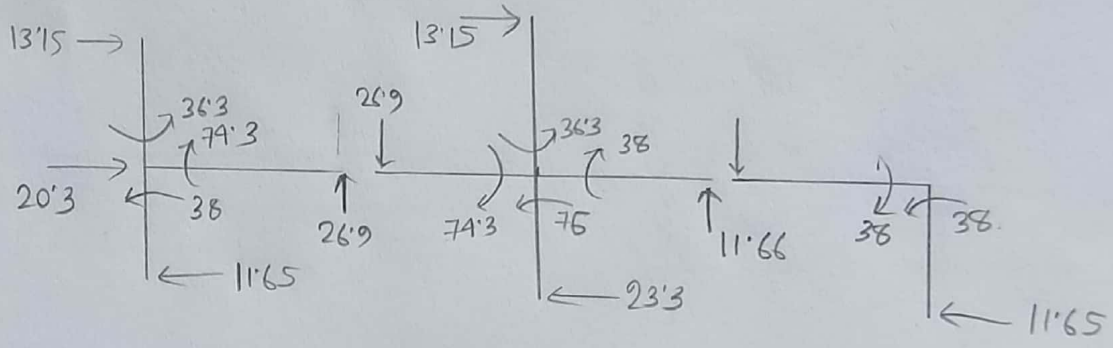
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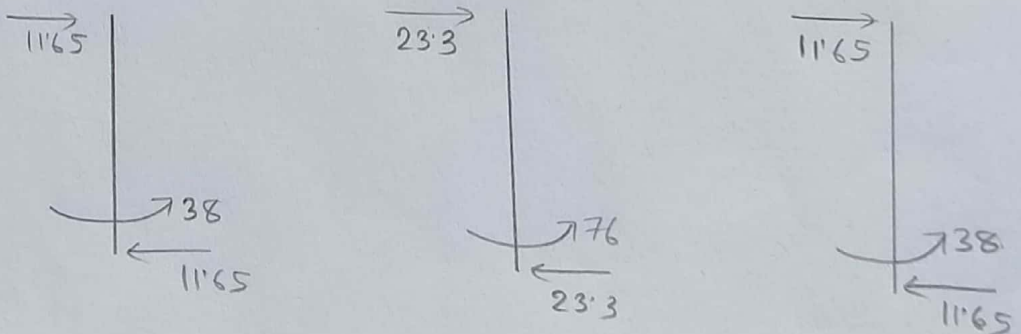
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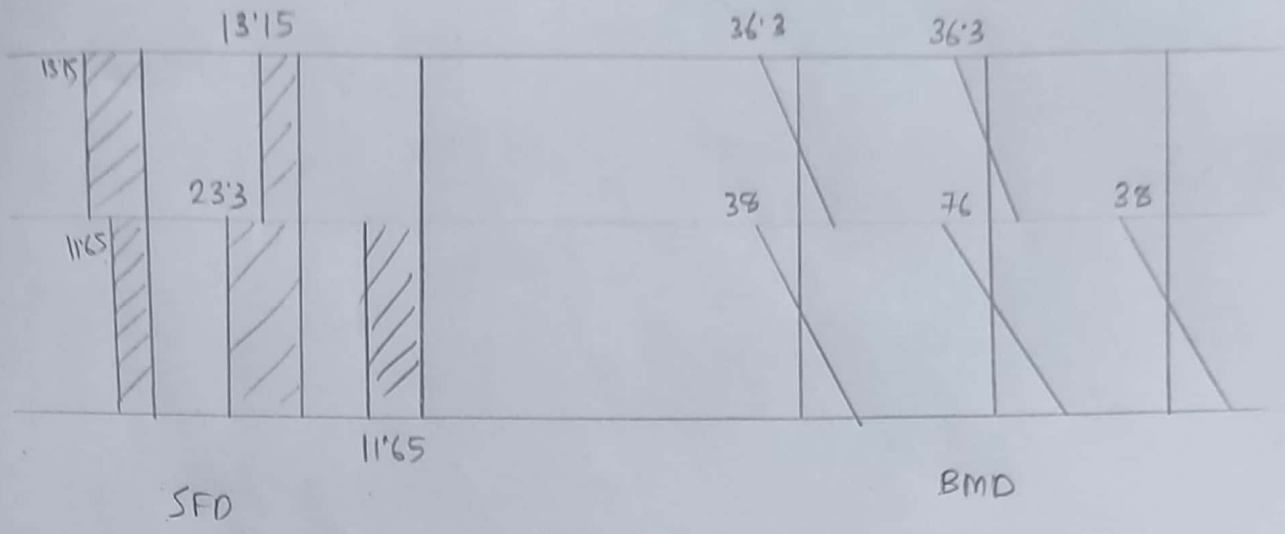
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SFD
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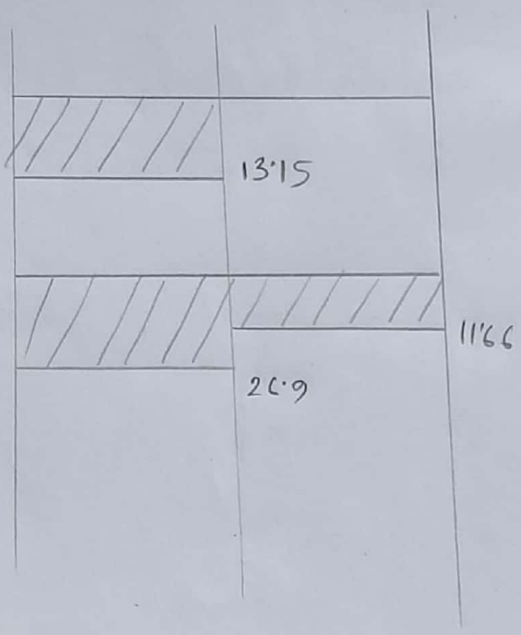
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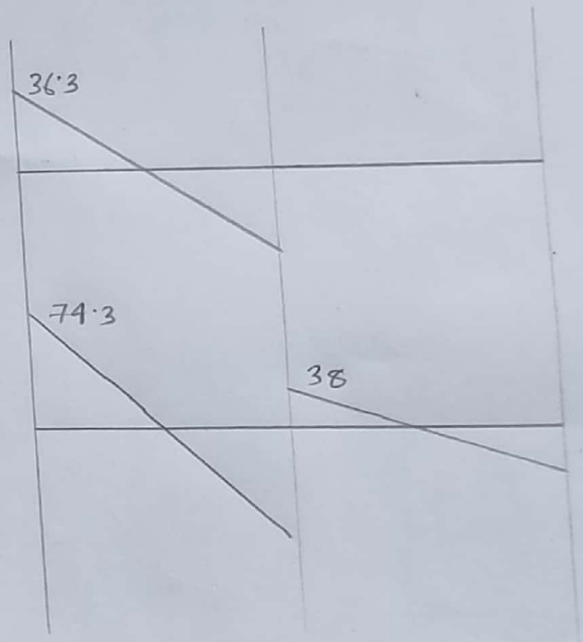
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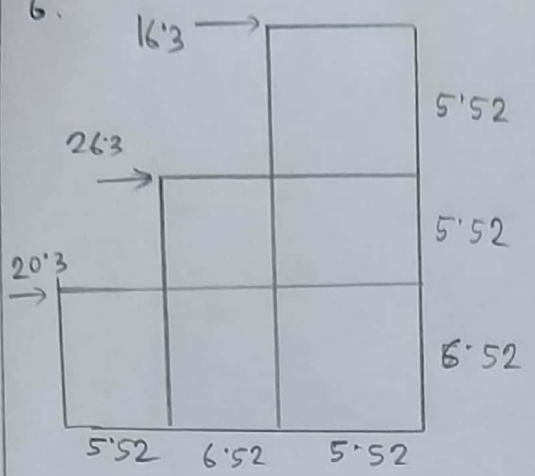
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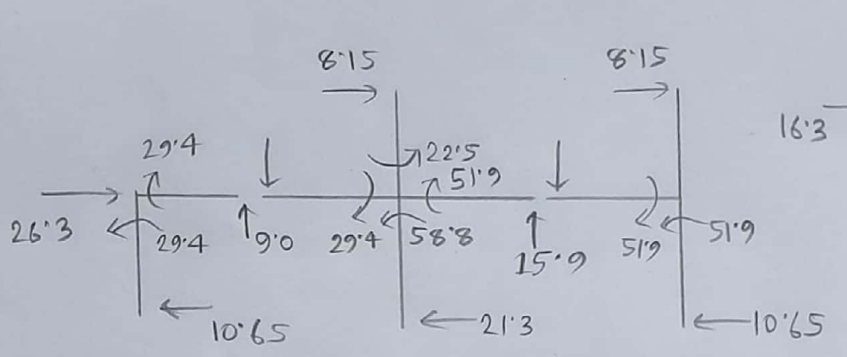
solution: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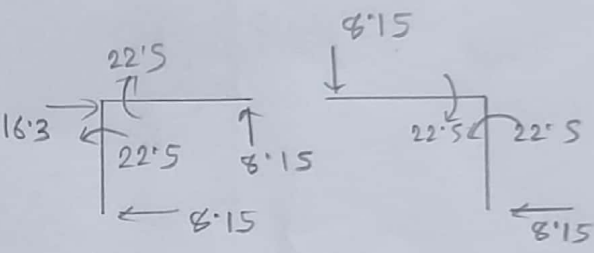
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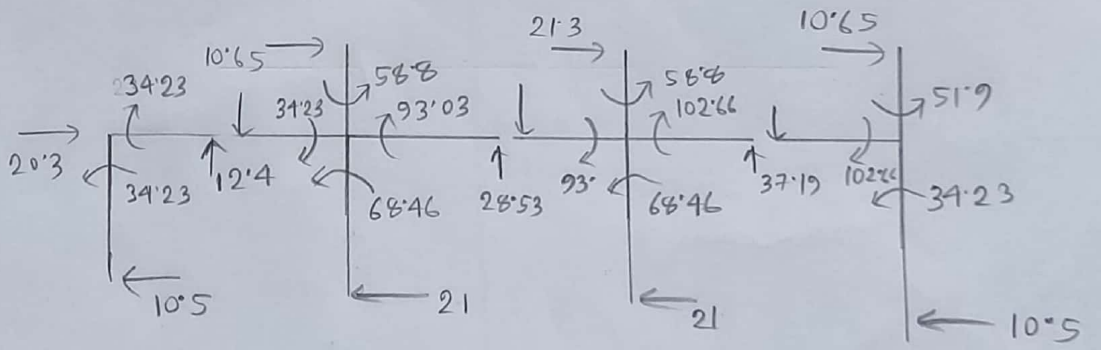
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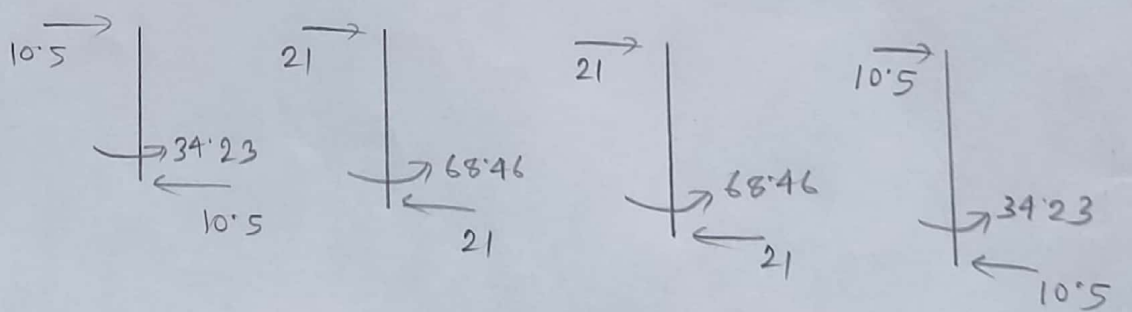
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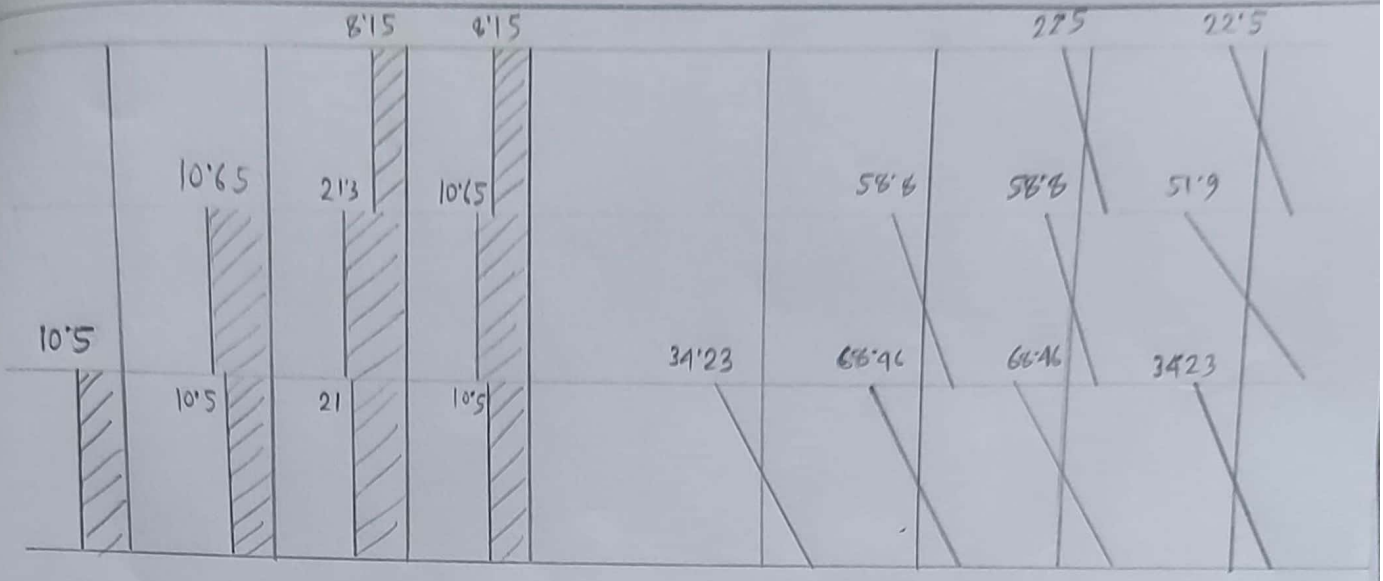
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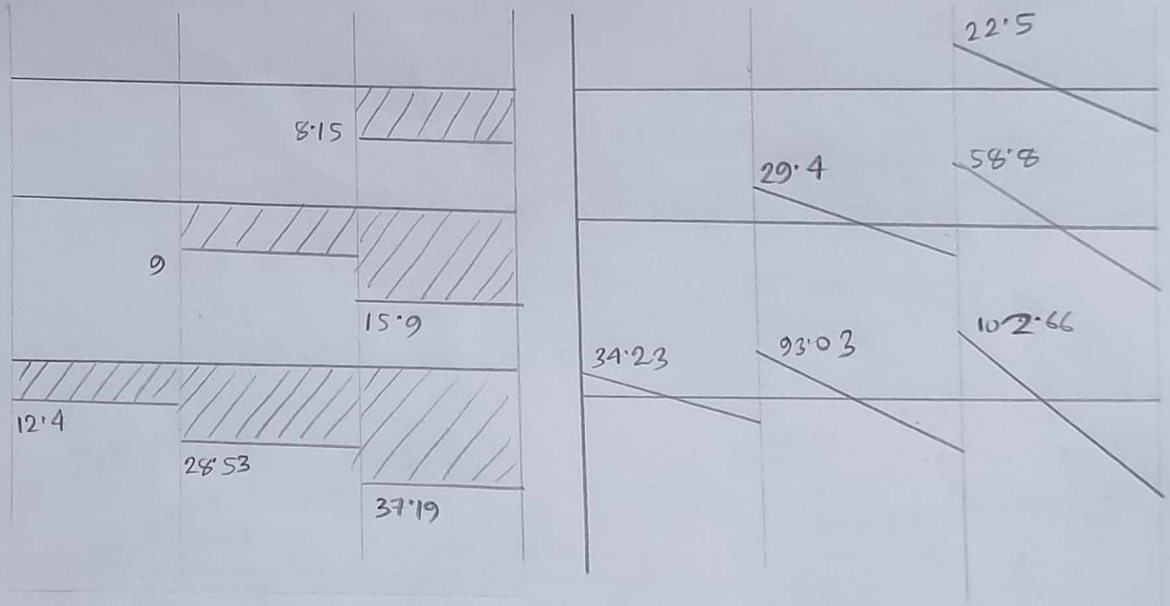
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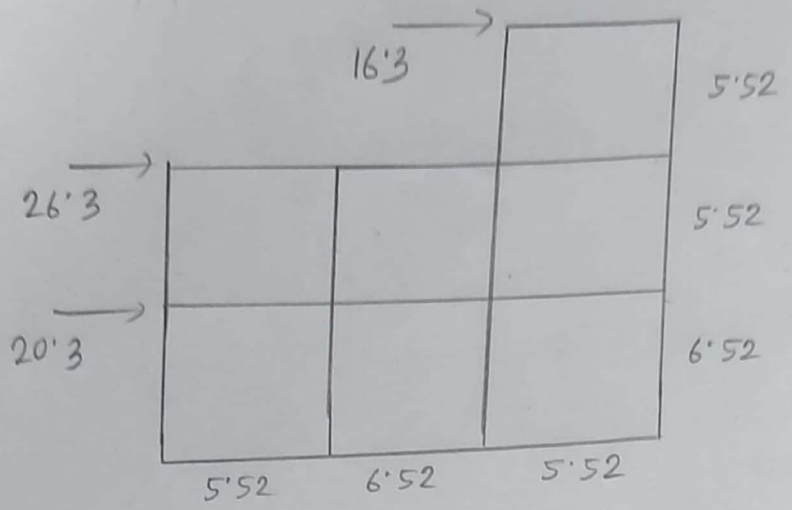
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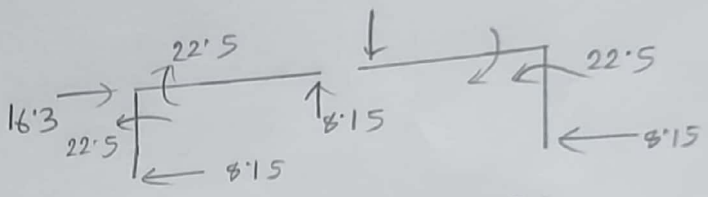
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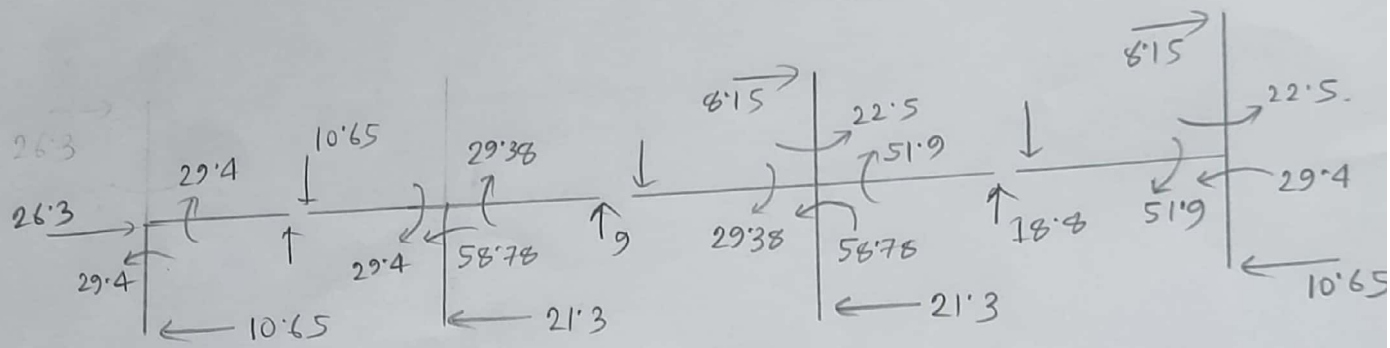
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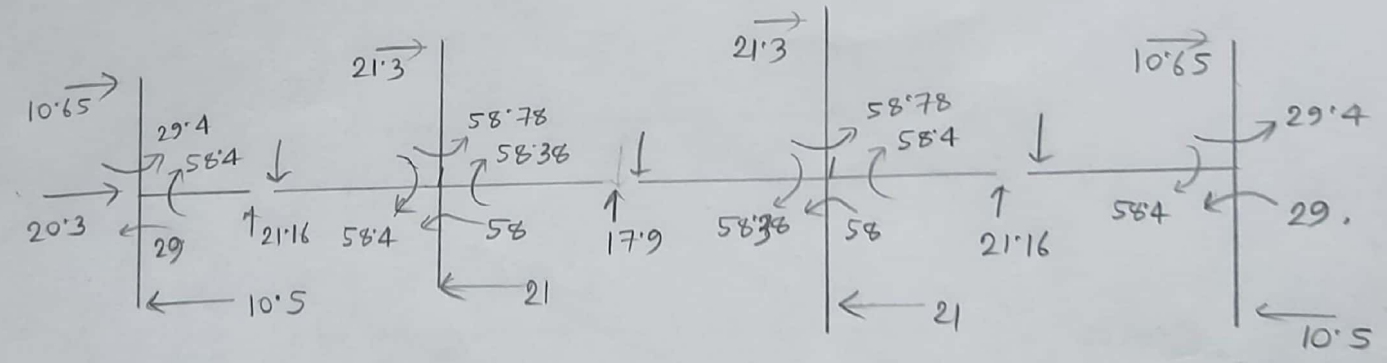
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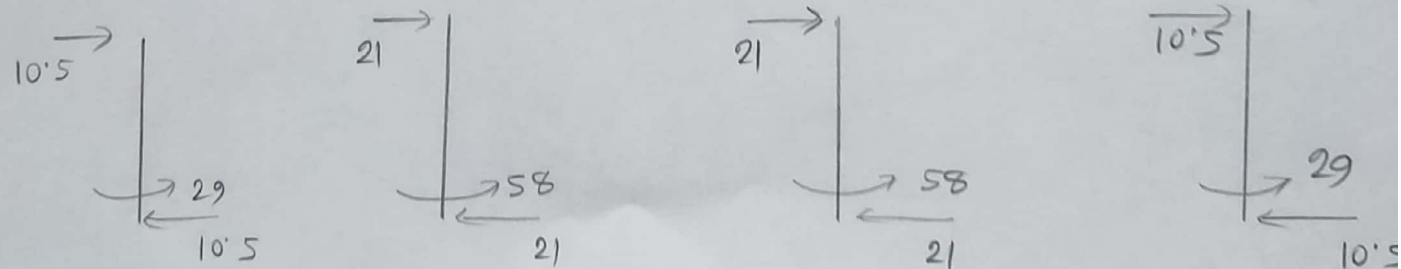
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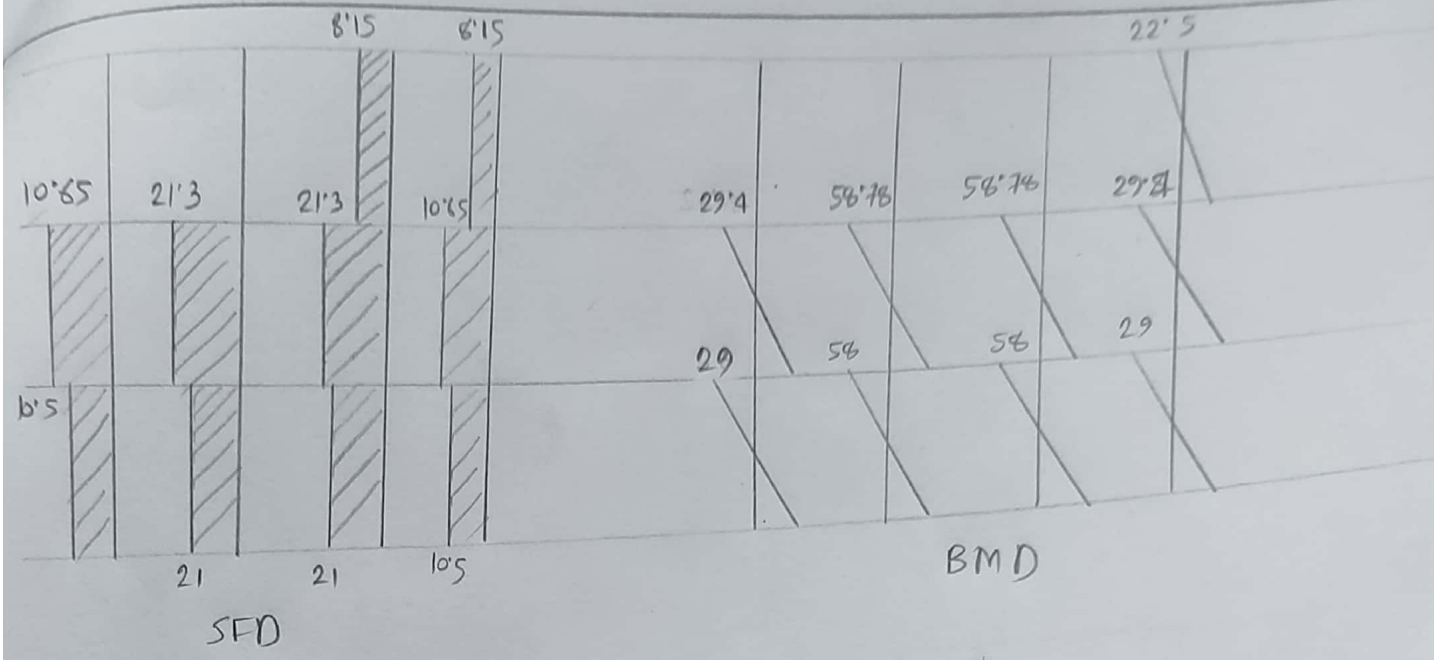
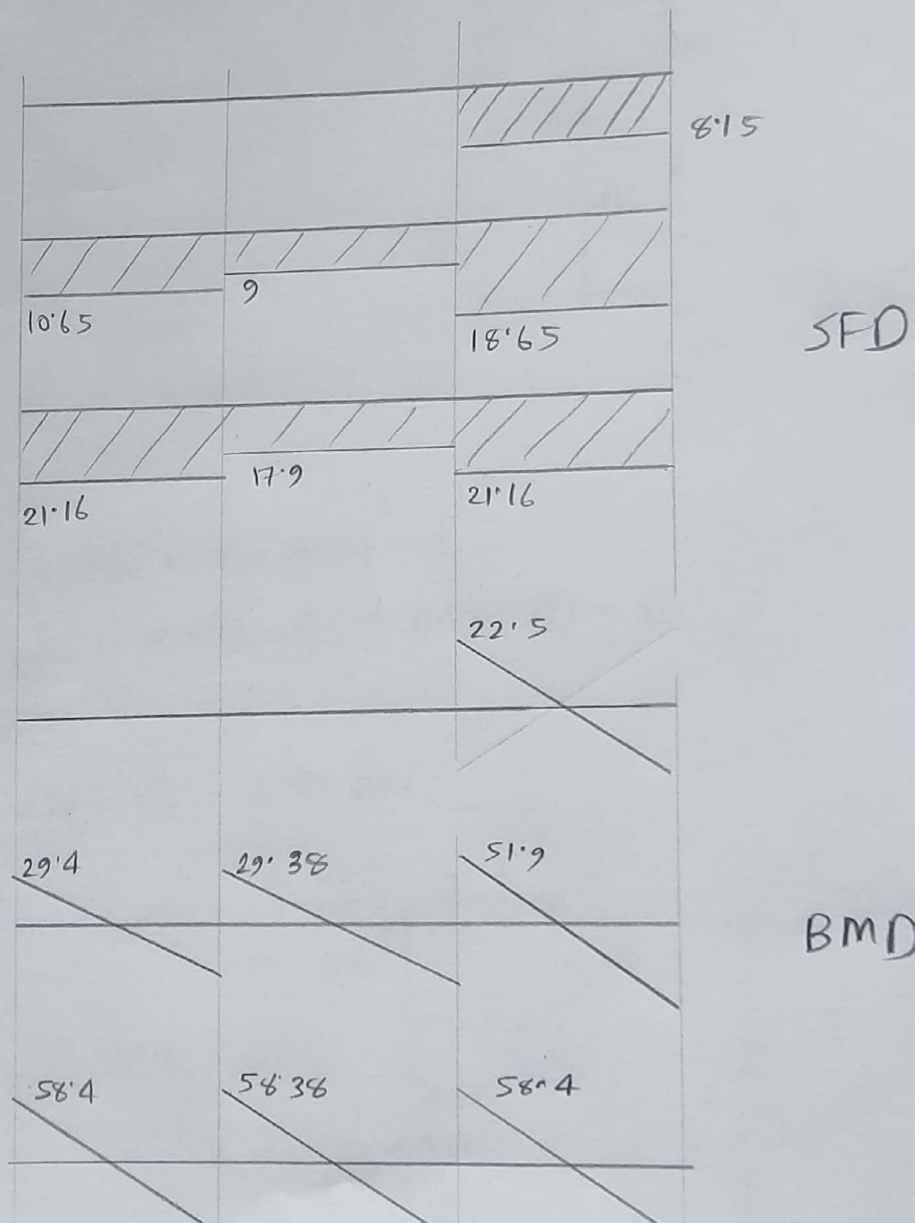
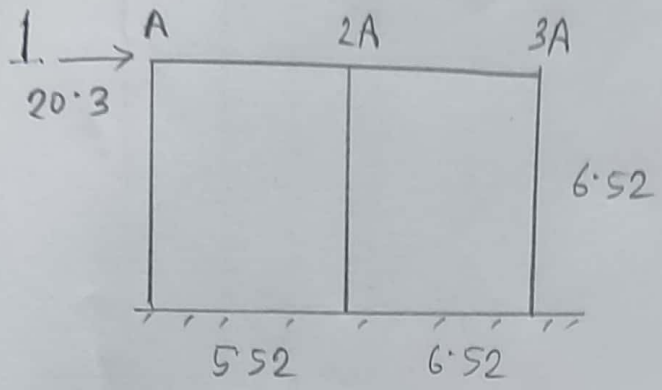
21
10·5


8.15
8.15
22.5
10.85
21.3
21.3
10.65
29.4
58.78
58.78
29.4
29
58
58
29
10.5
21
21
10.5
SFD
BMD


8.15
10.65
9
18.65
21.16
17.9
21.16
22.5
29.4
29.38
51.9
58.4
58.38
58.4
SFD
BMD

# Cantiliver Method

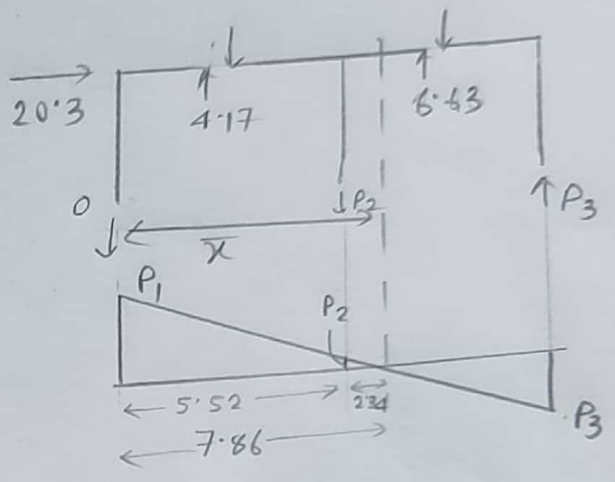
1.




Solution:

$$\bar{x} = \frac{(2A \times 5{\cdot}52) + (3A \times 12{\cdot}04)}{2A+3A+A}$$

$$= 7{\cdot}86$$




now,

$$\frac{P_1/A}{7{\cdot}86} = \frac{P_2/2A}{2{\cdot}34} = \frac{P_3/3A}{4{\cdot}18}.$$

$P_2 = {\cdot}59P_1$ ; $P_3 = 1{\cdot}59P_1$.

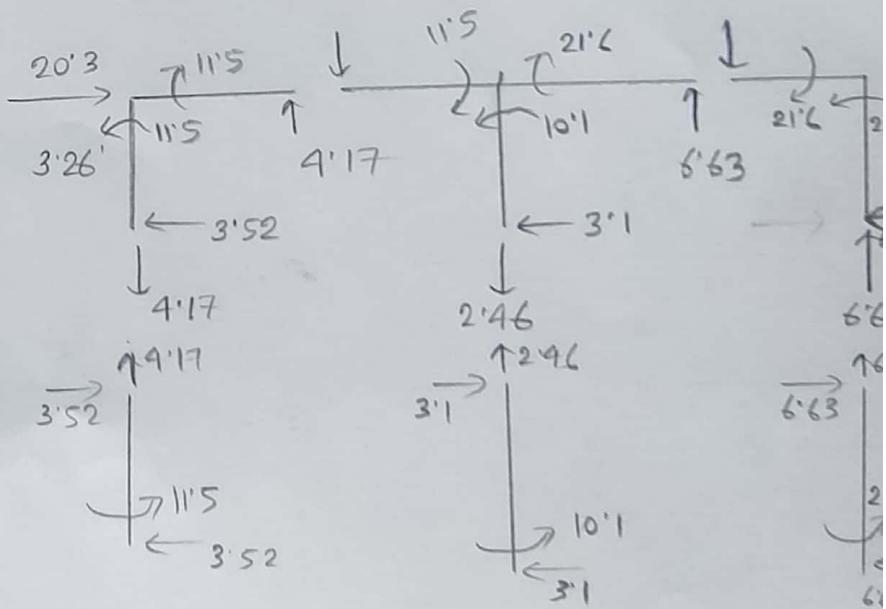
now, $\Sigma M_o = 0$.

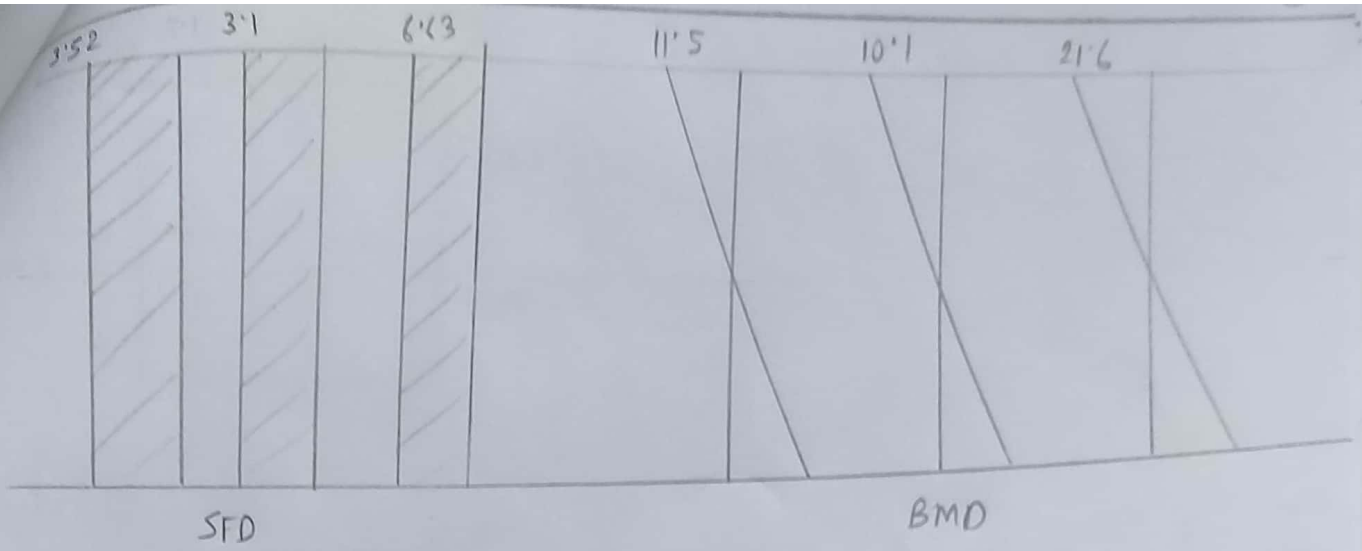
$20{\cdot}3 \times 3{\cdot}26 + P_2 \times 5{\cdot}52 - P_3 \times 12{\cdot}04 = 0$.

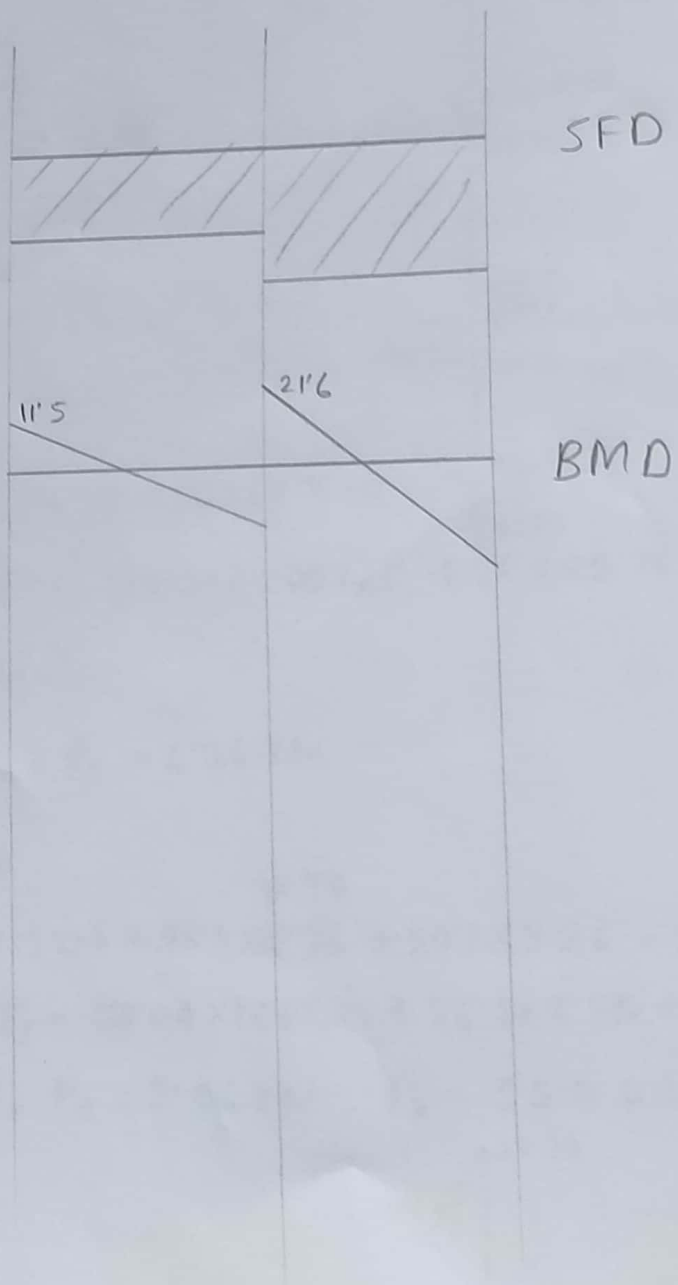
$\Rightarrow 20{\cdot}3 \times 3{\cdot}26 + P_2(5{\cdot}52 \times {\cdot}59) - P_1(12{\cdot}04 \times 1{\cdot}59) = 0$.

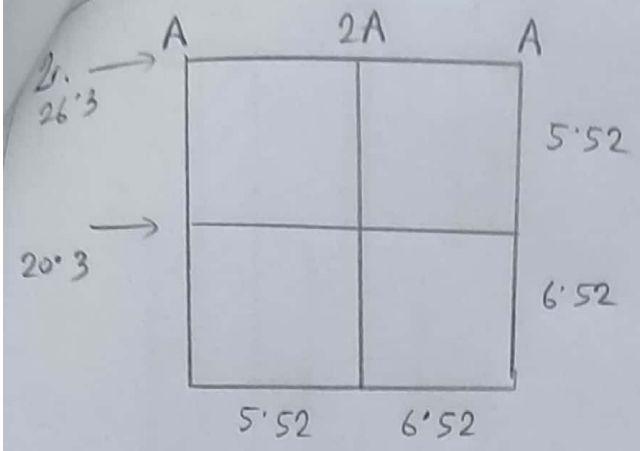
$\Rightarrow P_1 = 4{\cdot}17$ KN,

$\therefore P_2 = 2{\cdot}46$ KN ; $P_3 = 6{\cdot}63$ KN.



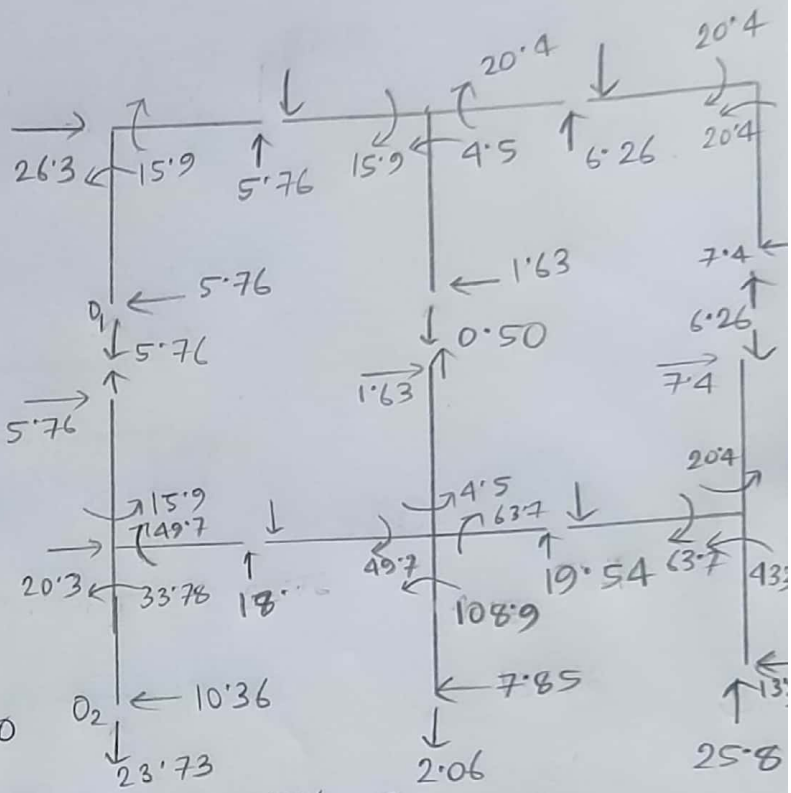

3·52
3·1
6·43
11·5
10·1
21·6
SFD
BMD


SFD
21·6
11·5
BMD




## Solution:

$$\bar{x} = \frac{2A \times 5{\cdot}52 + A \times 6{\cdot}52}{A + 2A + A} = 5{\cdot}77 \qquad (12{\cdot}04)$$




now,

$$\frac{P_1/A}{5{\cdot}77} = \frac{P_2/2A}{{\cdot}25} = \frac{P_3/A}{6{\cdot}27}$$

$\Rightarrow P_2 = 0{\cdot}087\, P_1$

$P_3 = 1{\cdot}087\, P_1$.

$\Sigma M_{O_1} = 0$

$\Rightarrow -P_3 \times 12{\cdot}04 + P_2 \times 5{\cdot}52 + 26{\cdot}3 \times 2{\cdot}76 = 0$

$\Rightarrow P_1(5{\cdot}52 \times 0{\cdot}087) - (12{\cdot}04 \times 1{\cdot}087)\, P_1 + 26{\cdot}3 \times 2{\cdot}76 = 0$

$\Rightarrow P_1 = 5{\cdot}76$ kN.

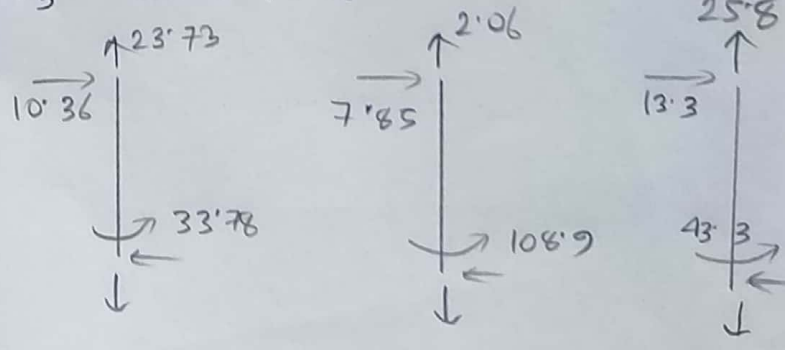
$P_2 = 0{\cdot}50$ kN ; $P_3 = 6{\cdot}26$ kN.

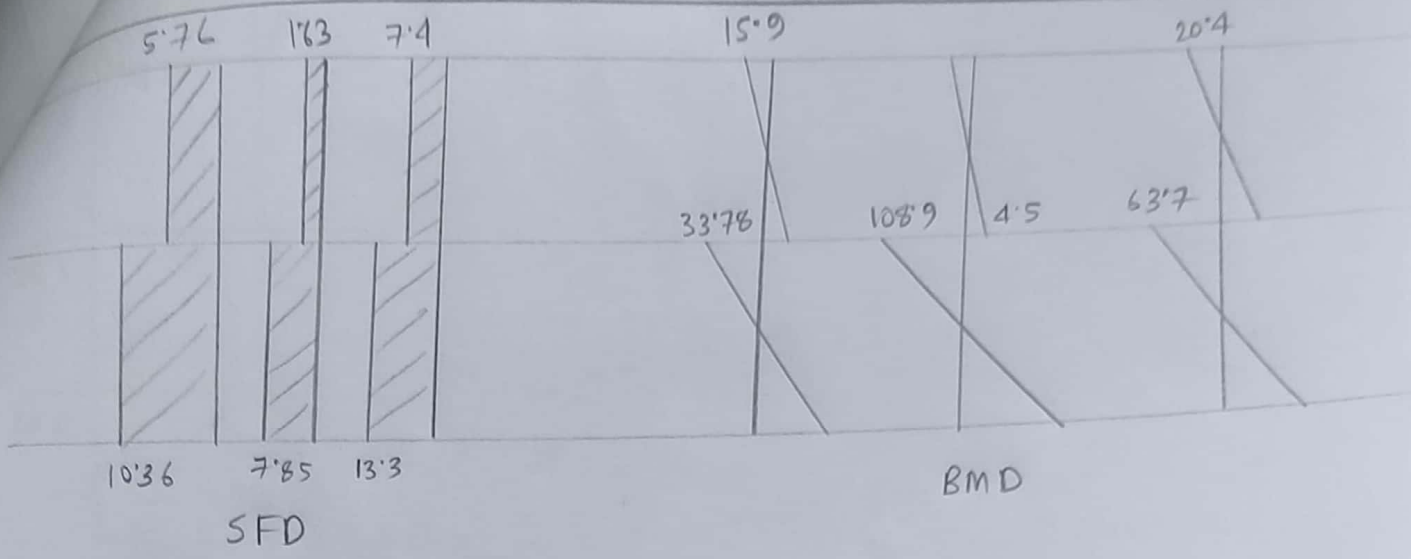
Again, $\Sigma M_{O_2} = 0$ (8·78)

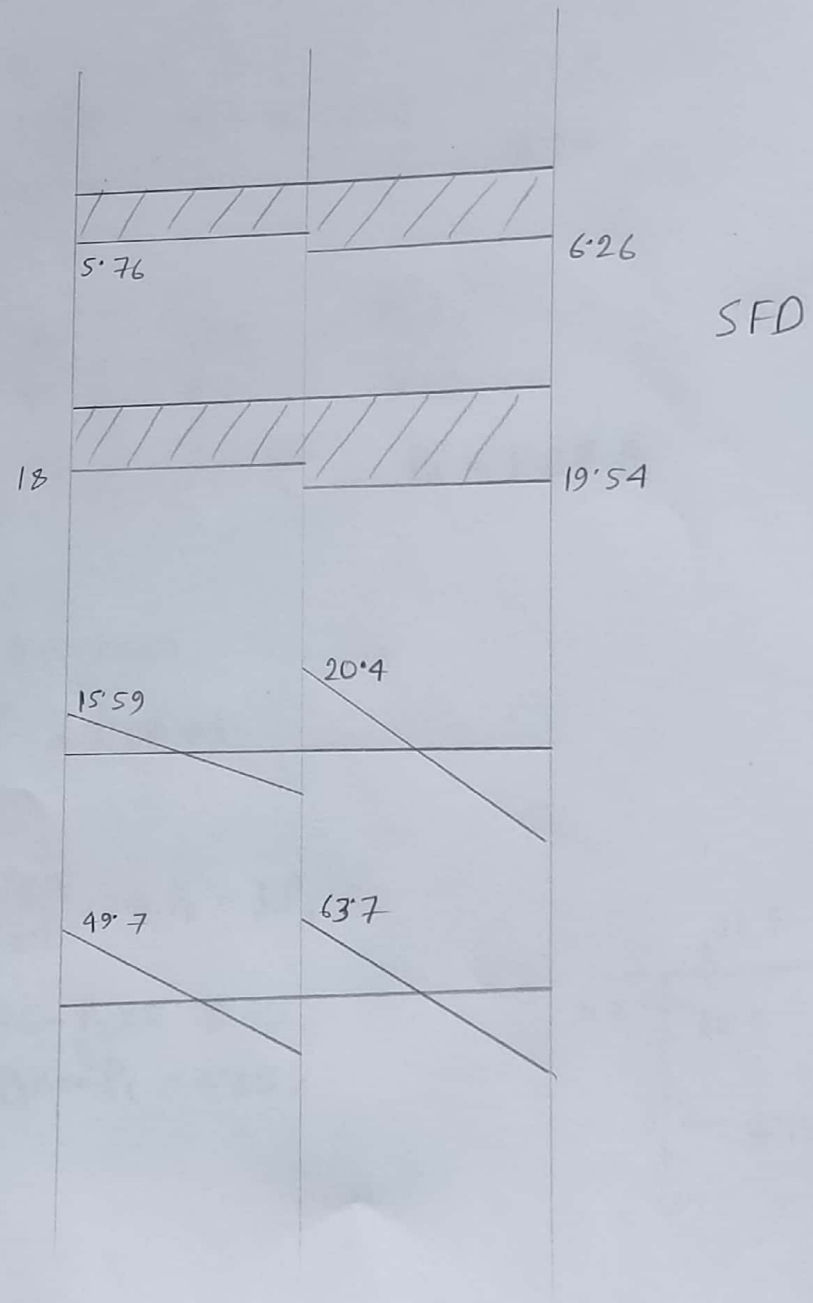
$\Rightarrow 5{\cdot}52 P_2 - P_3 \times 12{\cdot}04 + 26{\cdot}3 \times$ ~~2·76~~ $+ 20{\cdot}3 \times 3{\cdot}26 = 0$.

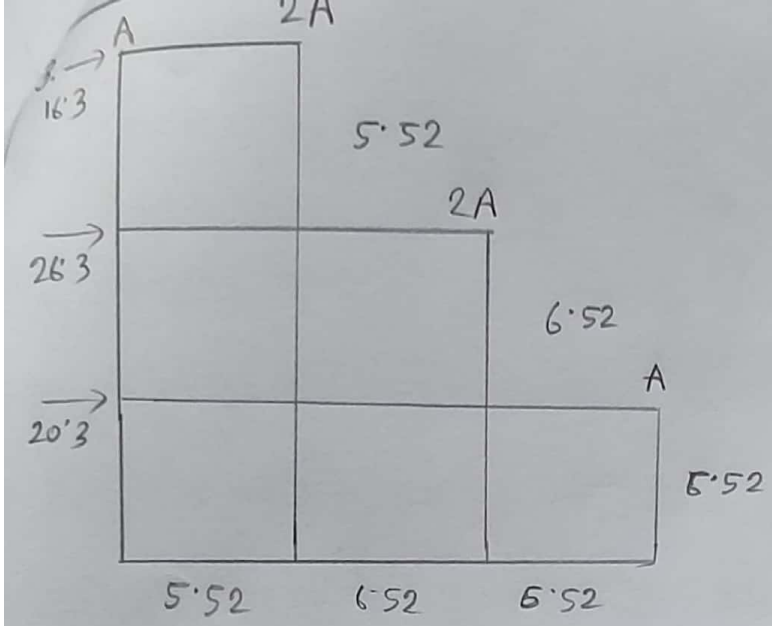
$\Rightarrow (0{\cdot}087 \times 5{\cdot}52) P_1 - (12{\cdot}04 \times 1{\cdot}087) P_1 + 26{\cdot}3 \times 8{\cdot}78 + 20{\cdot}3 \times 3{\cdot}36 = 0$.

$\Rightarrow P_1 = 23{\cdot}73$ kN, $P_2 = 2{\cdot}06$ kN , $P_3 = 25{\cdot}8$ kN.




5·76
18·3
7·4
15·9
20·4
33·78
108·9
4·5
63·7
10·36
7·85
13·3
SFD
BMD


6·26
5·76
SFD
18
19·54
20·4
15·59
49·7
63·7




solution: for lowest parts,

$$\bar{x} = \frac{(2A \times 5{\cdot}52) + (2A \times 12{\cdot}04) + (A \times 18{\cdot}56)}{A + 2A + 2A + A} = 8{\cdot}94$$

now,

$$\frac{P_1''/A}{8{\cdot}94} = \frac{P_2''/2A}{3{\cdot}42} = \frac{P_3''/2A}{3{\cdot}1} = \frac{P_4''/A}{9{\cdot}62}$$

$$\Rightarrow P_2'' = 0{\cdot}76\,P_1 \quad ; \quad P_3'' = 0{\cdot}69\,P_1 \quad ; \quad P_4'' = 1{\cdot}08\,P_1$$

~~$\Sigma M_o = 0 \Rightarrow$~~

For upper members,

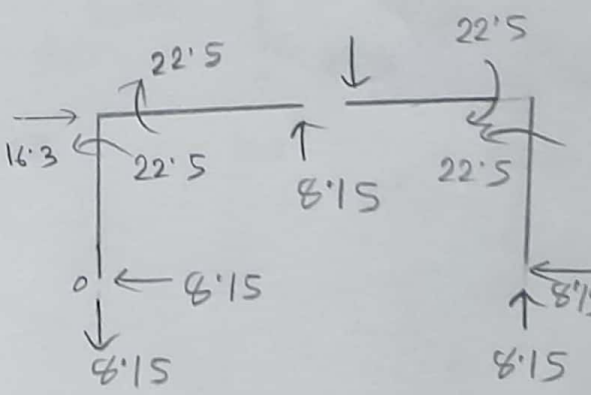
$$\bar{x} = \frac{2A \times 5{\cdot}52}{2A + A} = 3{\cdot}68 \text{ ft}$$

now,

$$\frac{P_1/A}{3{\cdot}68} = \frac{P_2/2A}{1{\cdot}84} \Rightarrow P_2 = 1.P_1$$

$M_o = 0 \Rightarrow 16{\cdot}3 \times 2{\cdot}76 - P_2 \times 5{\cdot}52 = 0$

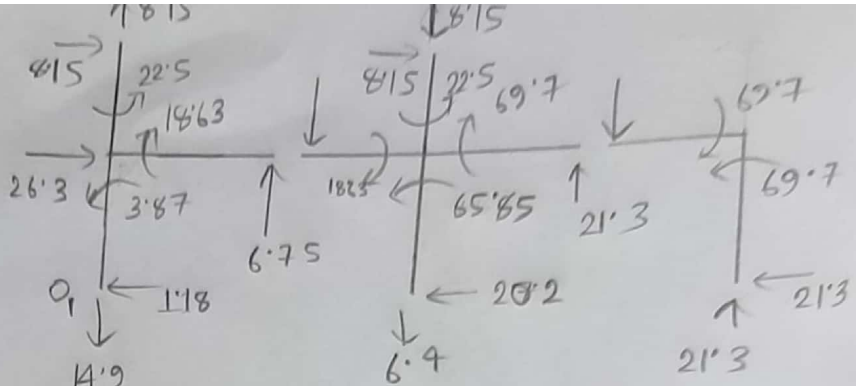
$\Rightarrow P_2 = $ ~~0·123 k~~ $P_1 = 8{\cdot}15\,k$



## middle portion,

$$\bar{x} = \frac{(2A \times 5.52) + (2A \times 12.04)}{A + 2A + 2A}$$

$$= 7.024'$$




$\Sigma M_{O_1} = 0$

$\Rightarrow 26.3 \times 8.79 + P_2' \times 5.52 - P_3' \times 12.4 = 0.$

$\Rightarrow (5.52 \times 0.43) P_1 - (12.4 \times 1.43) P_1 + 16.3 \times 8.79 + 26.3 \times 3.26 = 0$

$\Rightarrow P_1' = 14.9$

$$\frac{P_1'/A}{7.024} = \frac{P_2'/2A}{1.504} = \frac{P_3'/2A}{5.016} \Rightarrow P_2' = 0.43 P_1 \; ; \; P_3' = 1.43 P_1.$$

$\therefore P_2' = 6.4 \text{ k} \; ; \; P_3' = 21.307 \text{k}$

## For lower portion

$M_{O_2} = 0.$

$(16.3 \times 15.3) + (26.3 \times 9.78) + (20.3 \times 3.26) + (P_2'' \times 5.52) - (P_3'' \times 12.04) - (P_4'' \times 18.56) = 0$

$\Rightarrow 572.782 + 5.52 P_2'' - 12.04 P_3 - 18.56 P_4''$

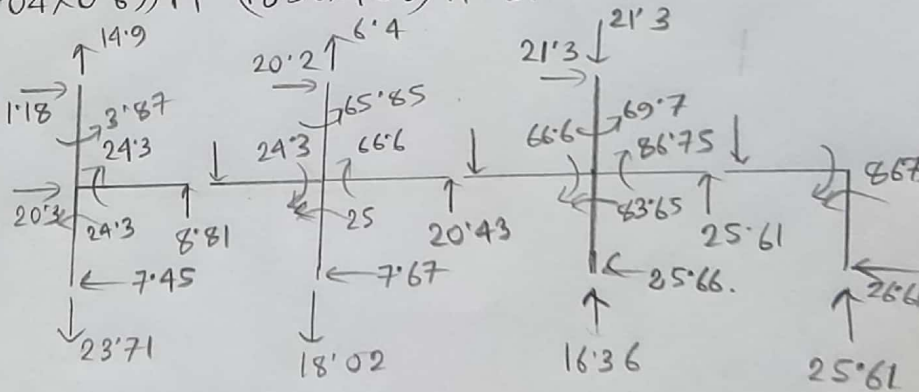
$\Rightarrow 572.782 + (5.52 \times .76) P_1 - (12.04 \times 0.69) P_1 - (18.56 \times 1.08) P_1 = 0.$

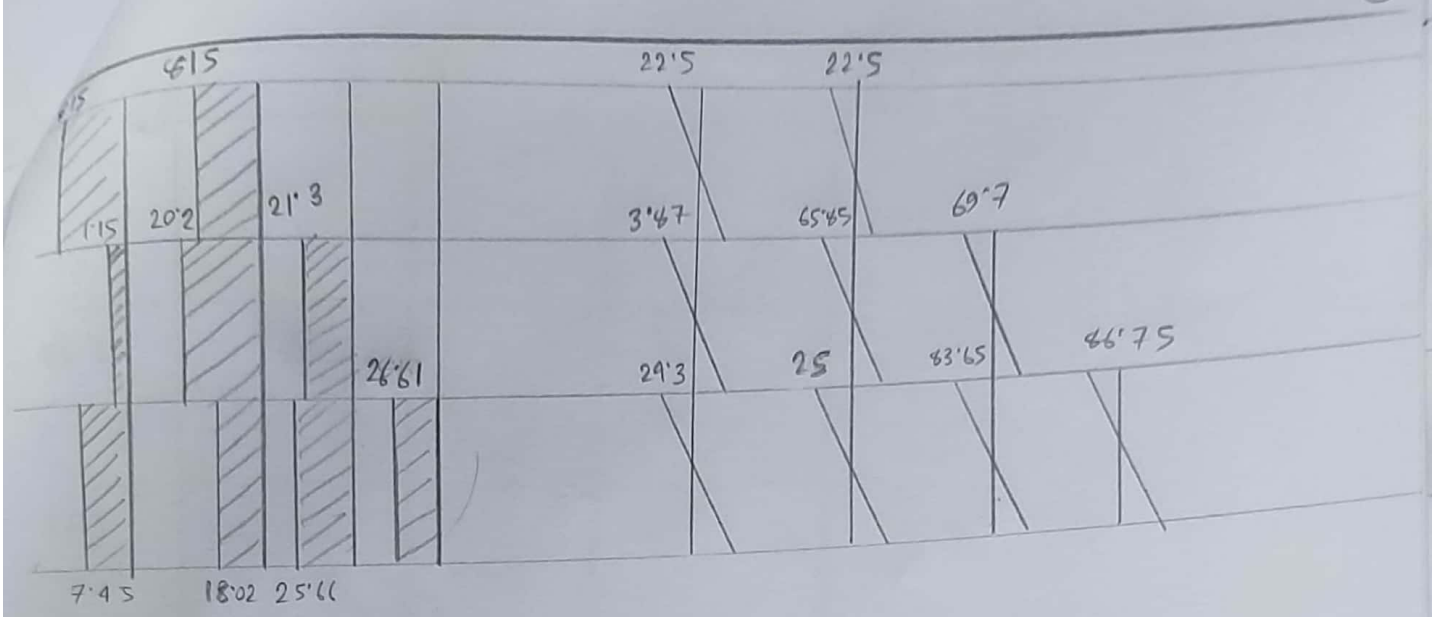
$\Rightarrow 572.782 + (5.52 \times .76) P_1 - (12.04 \times 0.69) P_1 - (18.56 \times 1.08) P_1 = 0.$

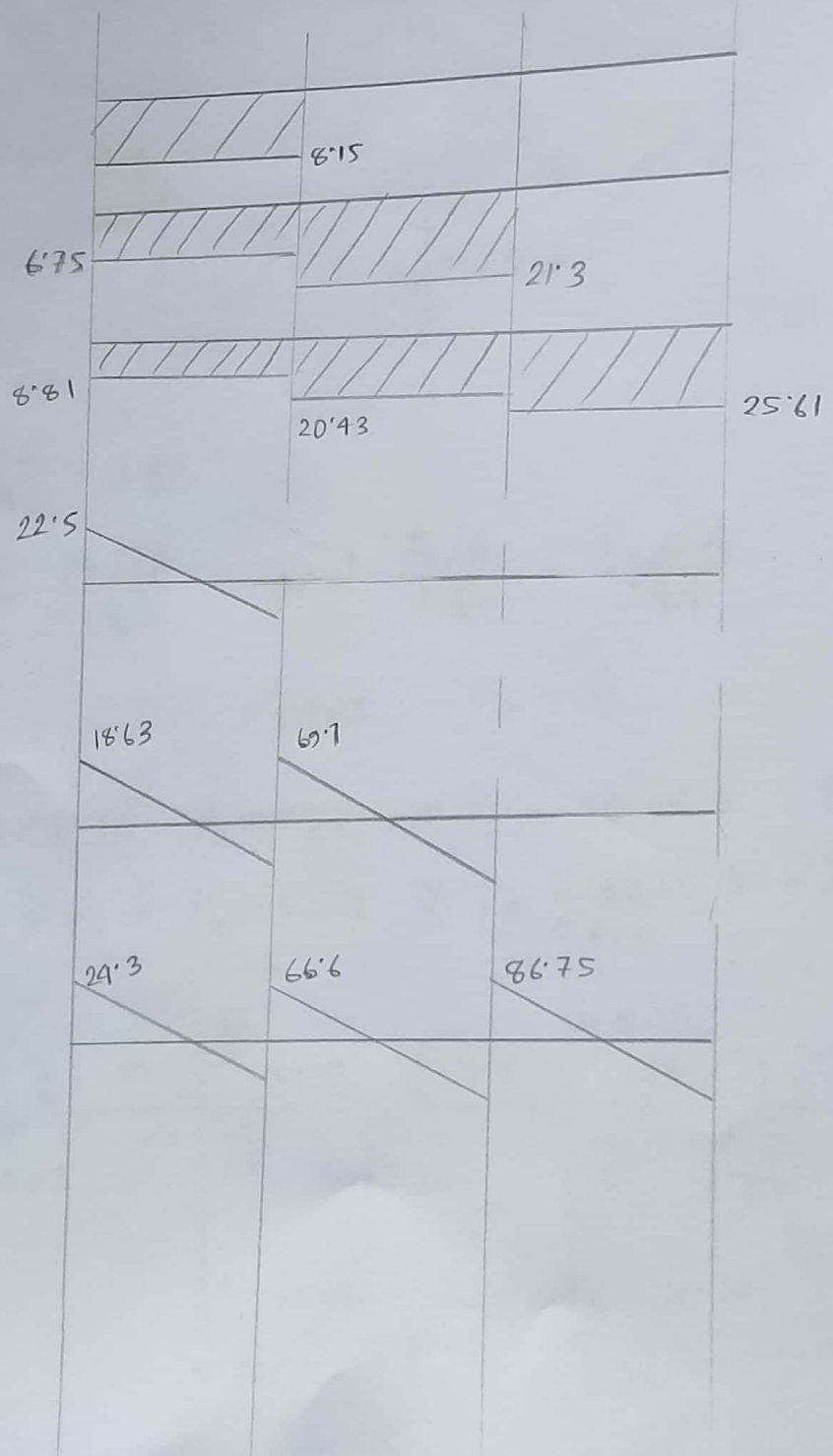
$\Rightarrow P_1 = 23.71.$

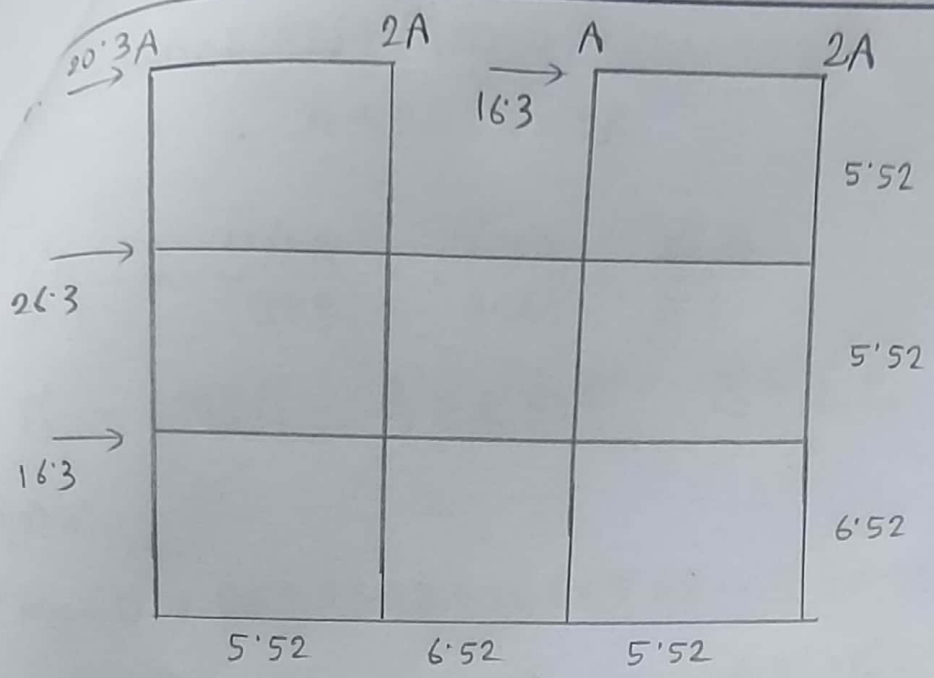
$\therefore P_2 = 18.02 \text{ k}, P_3 = 16.36 \text{k}$

$P_4 = 25.6068.$

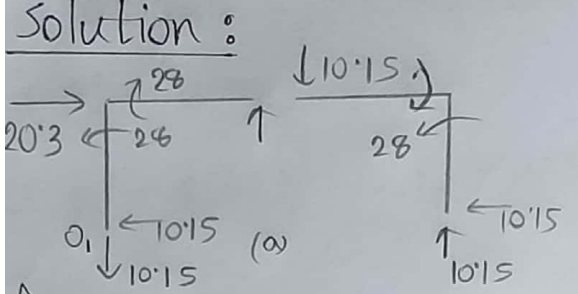


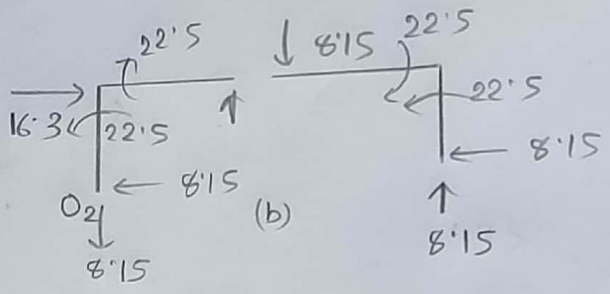

6.15
22.5
22.5
1.15
20.2
21.3
3.47
65.85
69.7
19.81
29.3
25
83.65
96.75
7.45
18.02
25.66


8.15
6.75
21.3
18.9
20.43
25.61
22.5
18.63
69.7
29.3
99.6
96.75




## Solution :




for (a) and (b)

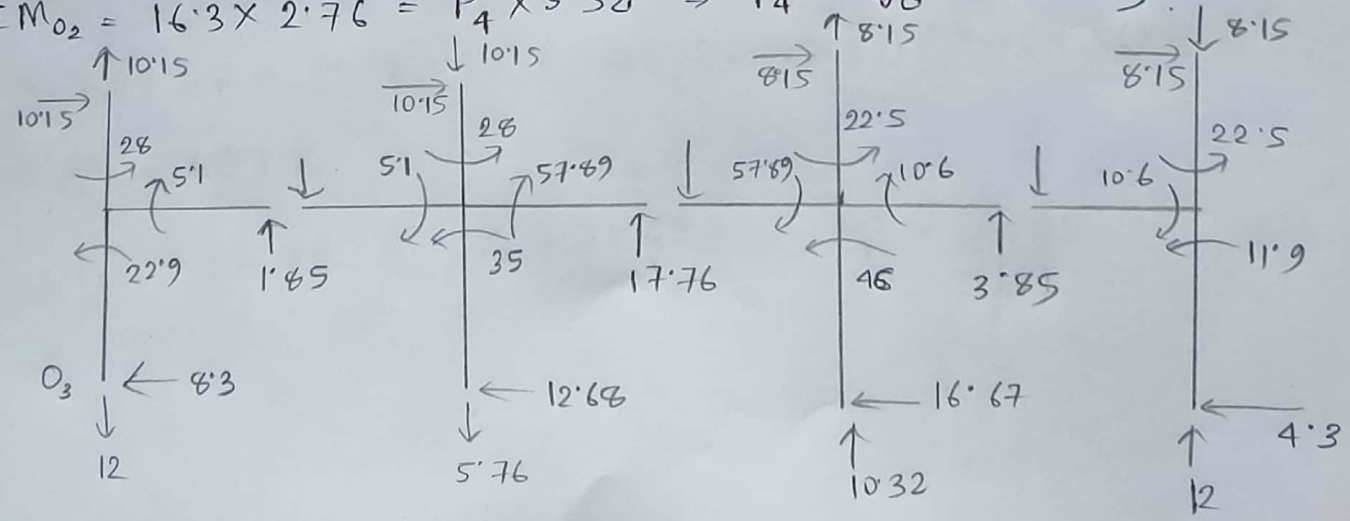
$$\bar{x} = \frac{2A \times 5.52}{2A + A} = 3.68'$$

now, $\frac{P_1/A}{3.68} = \frac{P_2/2A}{1.84}$ and $\frac{P_3/A}{3.68} = \frac{P_4/2A}{1.84}$

$\Rightarrow P_2 = P_1$ and, $P_4 = P_3$

$\Sigma M_{O_1} = 20.3 \times 2.76 = P_2 \times 5.52 \Rightarrow P_2 = 10.15\ k = P_1$

$\Sigma M_{O_2} = 16.3 \times 2.76 = P_4 \times 5.52 \Rightarrow P_4 = 8.15\ k = P_3$



$$\bar{x} = \frac{(2A \times 5.52) + (A \times 12.04) + (2A \times 17.56)}{A + 2A + A + 2A} = 9.7'$$

$$\frac{P_1'/A}{9.7} = \frac{P_2'/2A}{2.34} = \frac{P_3'/2A}{4.18} = \frac{P_4'/A}{9.7}$$

$$\Rightarrow P_2' = 0.48 P_1' \; ; \; P_3' = 0.86 P_1' \; ; \; P_4' = 1. P_1'$$

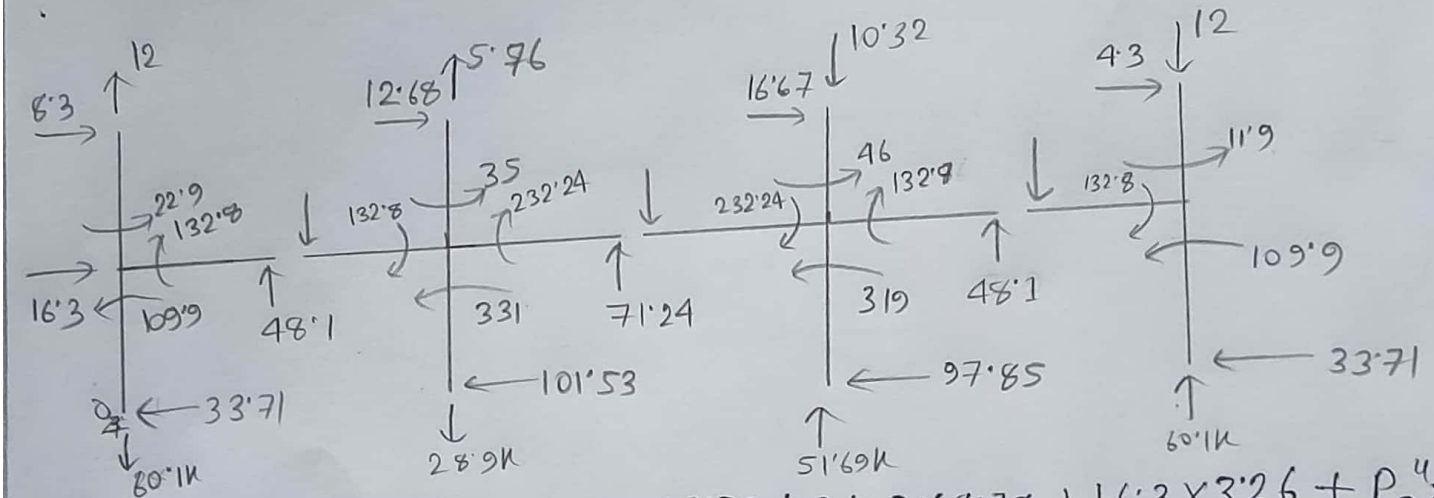
again,

$$\Sigma M_{O_3} = 0 \Rightarrow 20.3 \times 8.28 + 16.3 \times 8.28 + P_2' \times 5.52 - P_3' \times 12.04 - P_4' \times 17.56 = 0.$$

$$\Rightarrow 303.048 + (5.52 \times 0.48) P_1' - (12.04 \times 0.86) P_1' - (17.56 \times 1) P_1' = 0.$$

$$\Rightarrow P_1' = 11.99 \approx 12. K$$

$$\therefore P_2' = 5.76 K \; ; \; P_3' = 10.32 K \; ; \; P_4' = 12 K$$



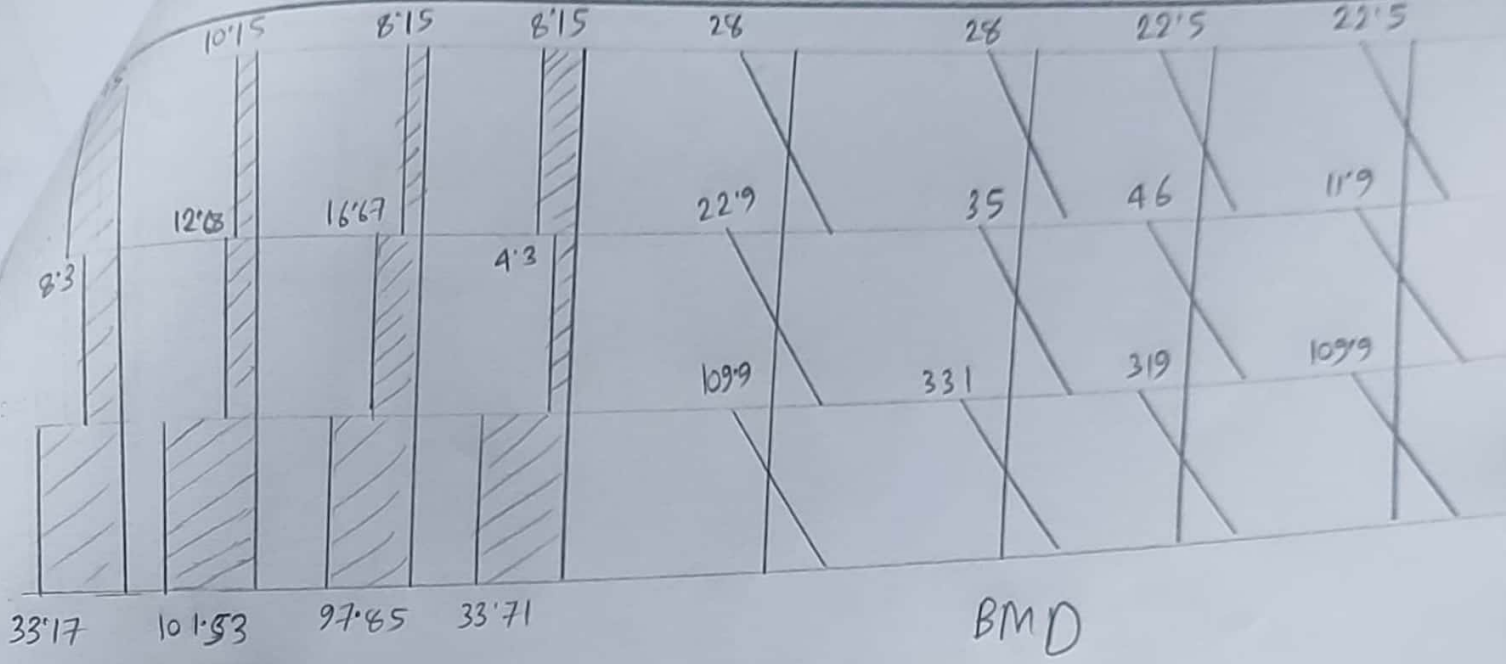

$$\Sigma M_{O_4} = 0 \Rightarrow 20.3 \times 33.73 + 16.3 \times 33.73 + 26.3 \times 8.78 + 16.3 \times 3.26 + P_2'' \times 5.52$$

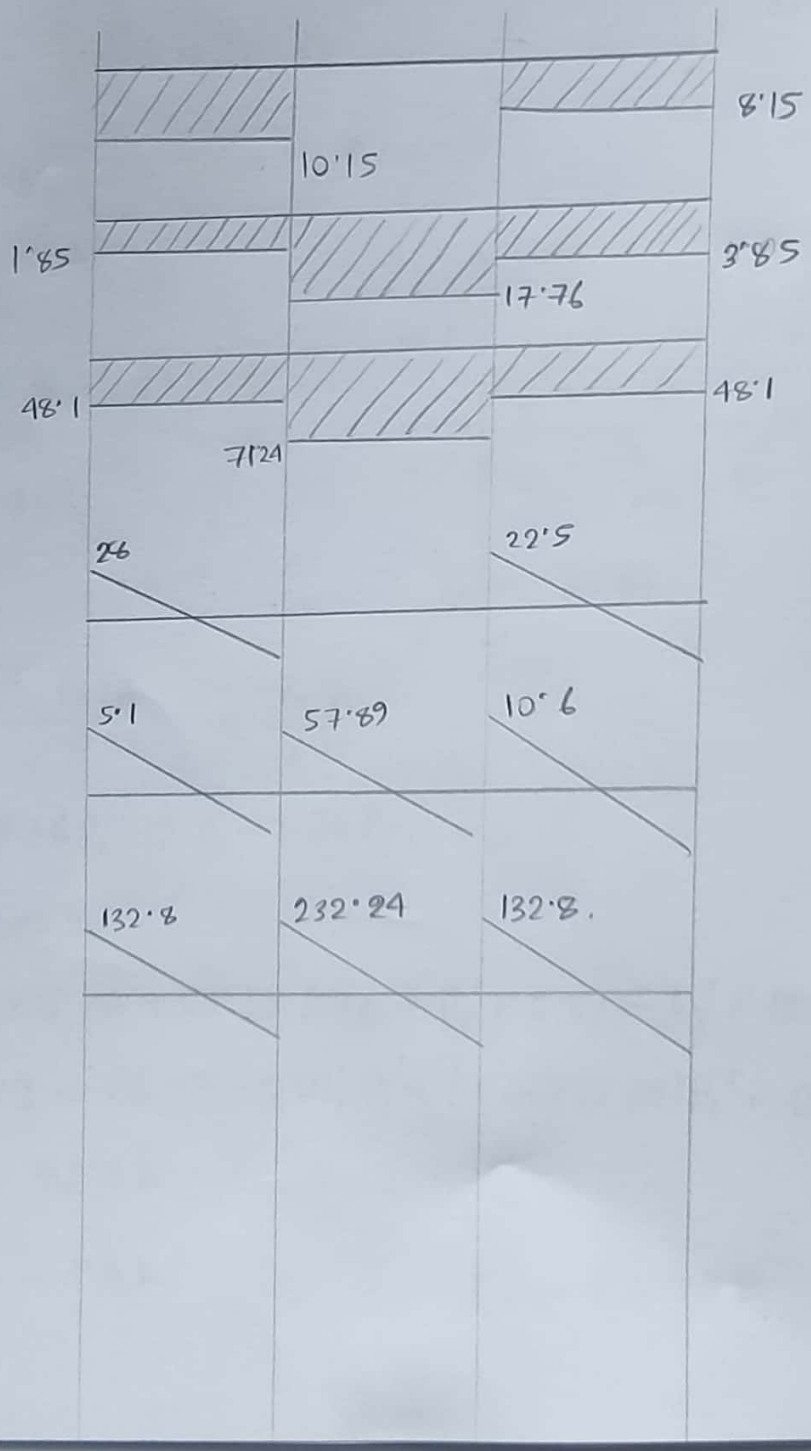
$$- P_3'' \times 12.04 - P_4'' \times 17.56 = 0.$$

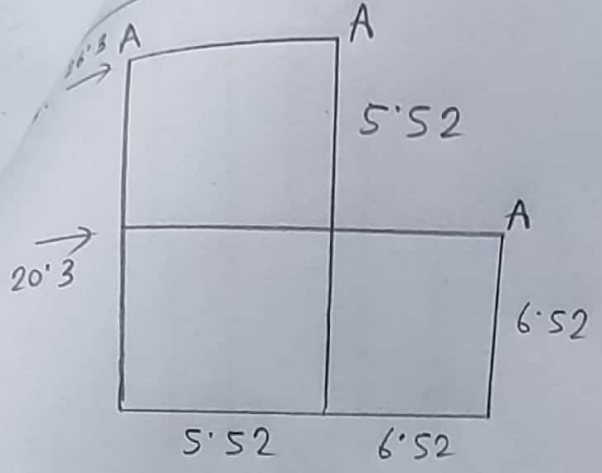
$$\Rightarrow 1518.57 + (5.52 \times .48) P_1'' - (12.04 \times 0.86) P_1'' - (17.56 \times 1) P_1'' = 0.$$

$$\Rightarrow P_1'' = 60.1 K$$

$$\therefore P_2'' = 28.9 K \qquad P_3'' = 51.69 K \qquad P_4'' = 60.1 K$$


10·15
8·15
8·15
28
28
22·5
22·5
8·3
12·83
16·67
4·3
22·9
35
46
11·9
109·9
331
319
109·9
33·17
101·53
97·85
33·71
SFD
BMD

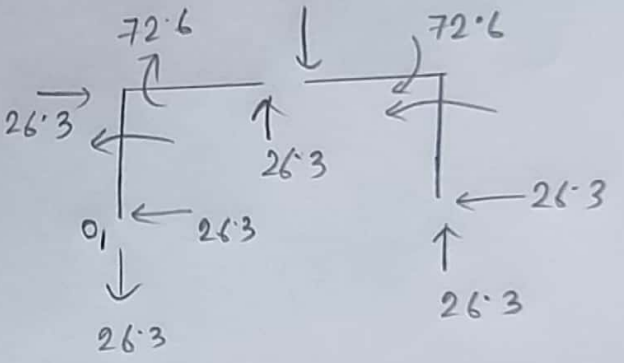

8·15
10·15
1·85
3·85
17·76
48·1
48·1
71·24
26
22·5
5·1
57·89
10·6
132·8
232·24
132·8.




Solution:

$$\bar{x} = \frac{A \times 5.52}{2A} = 2.61$$

$$\frac{P_1/A}{2.6} = \frac{P_2/A}{2.6} \Rightarrow P_1 = P_2$$

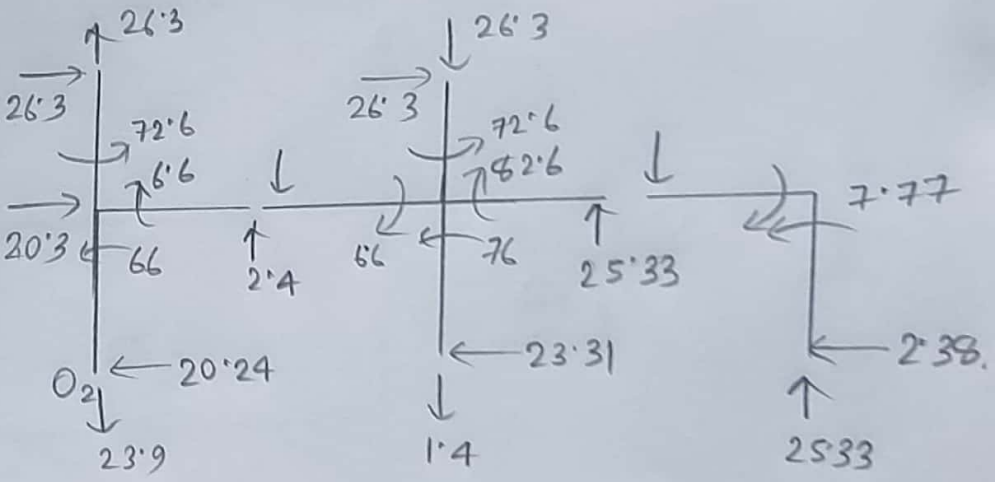



$$\Sigma M_{O_1} = 0 \Rightarrow P_2 \times 5.52 = 26.3 \times 5.52$$

$$\Rightarrow P_2 = 26.3$$

$$\bar{x} = \frac{(A \times 5.52) + A(\times 12.04)}{3A}$$

$$= 5.853$$




now,

$$\frac{P_1/A}{5.85} = \frac{P_2/A}{0.33} = \frac{P_3/A}{6.19}$$

$$\Rightarrow P_2 = 0.06 P_1 \quad ; \quad P_3 = 1.06 P_1.$$

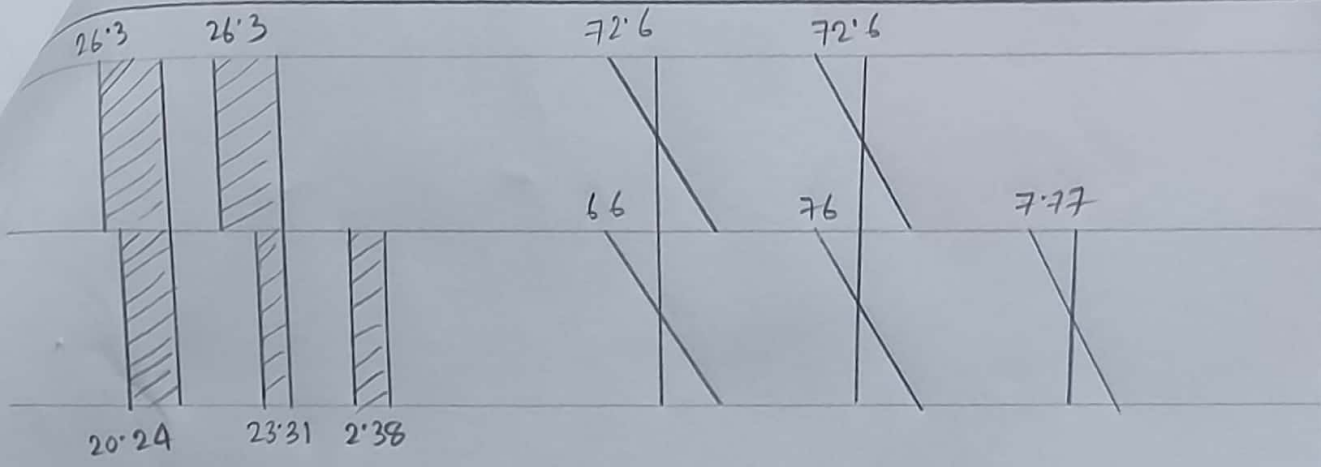
$$\Sigma M_{O_2} = 0$$

$$\Rightarrow 26.3 \times 6.78 + 20.3 \times 3.26 + P_2' \times 5.52 - P_3' \times 12.04 = 0,$$

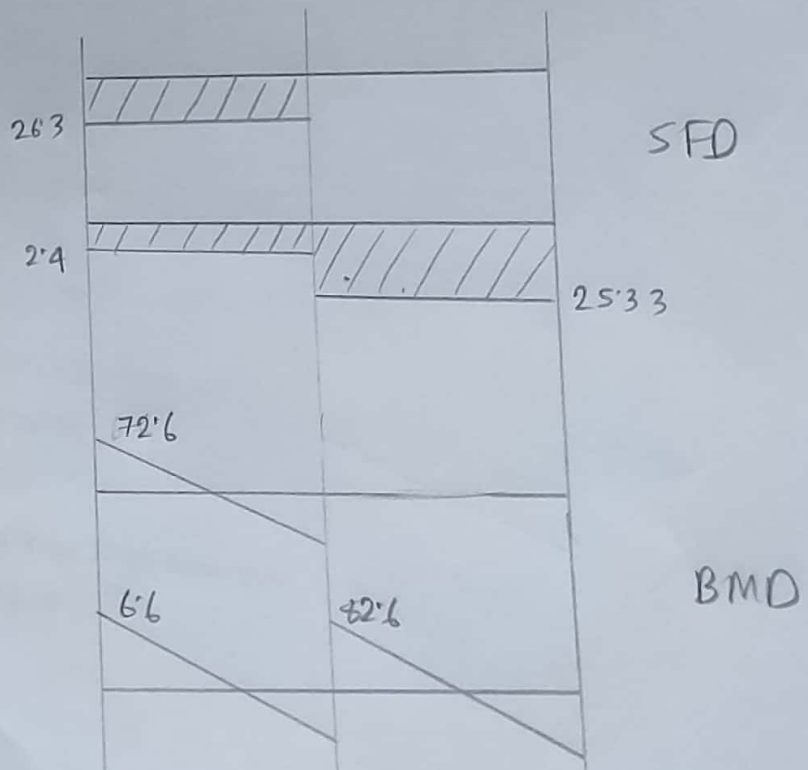
$$\Rightarrow 297.1 + (5.52 \times 0.06) P_1' - (1.06 \times 12.04) P_1' = 0$$

$$\Rightarrow P_1' = 23.9\,k$$

$$\therefore P_2' = 1.4\,k \qquad P_3' = 25.33\,k$$




SFD BMD




SFD

BMD