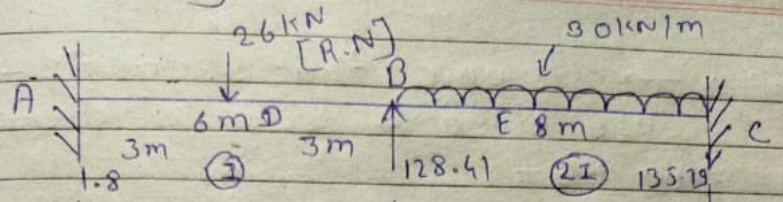
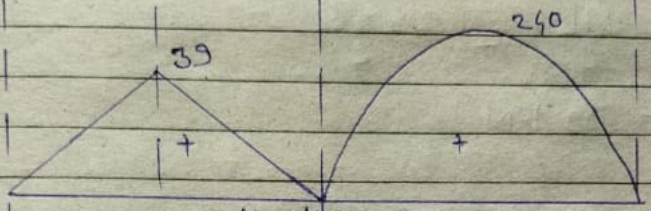
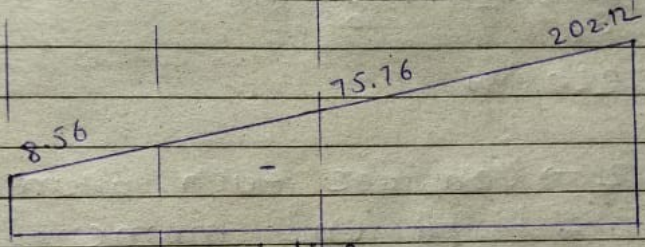
Assig- (Q.1)

1]

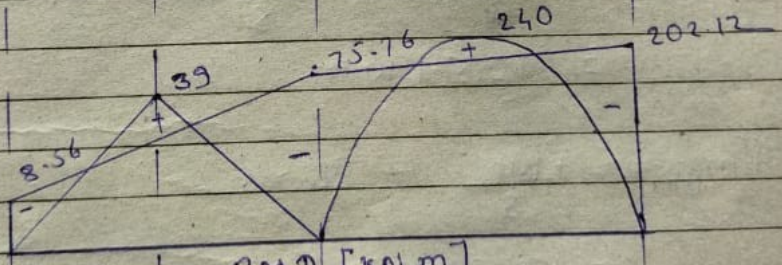




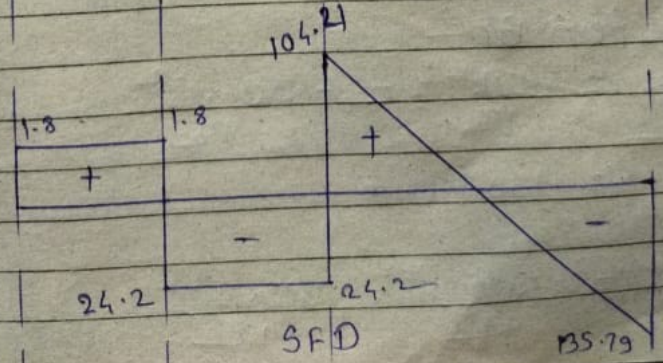
M- diag.



M'- diag.



BMD [KN.m]



SFD

→ Step 1 → Assume that span AB & BC are fixed & draw M-diagram.

For span AB –

$$M_D = \frac{WL}{4} = \frac{26 \times 6}{4}$$

$$= 39 \text{ kN}$$

For span BC –

$$M_E = \frac{WL^2}{8} = \frac{30 \times 8^2}{8}$$

$$= 240 \text{ kN}$$

Step-2 → Consider each span separately & fixed end moment

For span AB –

$$fm_{AB} = -\frac{WL}{8} = -\frac{26 \times 6}{8}$$

$$= -19.5 \text{ kN.m}$$

$$fm_{BA} = +\frac{WL}{8} = \frac{26 \times 6}{8}$$

$$= 19.5 \text{ kN.m}$$

For span BC –

$$fm_{BC} = -\frac{WL^2}{12} = -\frac{30 \times 8^2}{12}$$

$$= -160 \text{ kN.m}$$

$$fm_{CB} = +\frac{WL^2}{12} = \frac{30 \times 8^2}{12}$$

$= 160\ kN.m$

step-3 ⟶ formulation of slope deflection eqn -

for span AB — $\theta_A = \theta_C = 0$

$$M_{AB} = FM_{AB} + \frac{2EI}{l}[2\theta_A + \theta_B]$$

$$= -19.5 + \frac{2 \times 1}{6}[2\theta_A + \theta_B]$$

$$= -19.5 + 0.333EI\theta_B \quad \text{—— (I)}$$

$$M_{BA} = FM_{BA} + \frac{2EI}{l}[\theta_A + 2\theta_B]$$

$$= 19.5 + \frac{2 \times 1}{6}[\theta_A + 2\theta_B]$$

$$= 19.5 + 0.667EI\theta_B \quad \text{—— (II)}$$

for span BC —

$$M_{BC} = FM_{BC} + \frac{2EI}{l}[2\theta_B + \theta_C]$$

$$= -160 + \frac{2 \times 2}{8}[2\theta_B + \theta_C]$$

$$= -160 + EI\theta_B \quad \text{—— (III)}$$

$$M_{CB} = FM_{CB} + \frac{2EI}{l}[\theta_B + 2\theta_C]$$

$$= 160 + \frac{2 \times 2}{8}[\theta_B + 2\theta_C]$$

$= 160 + 0.5\,EI\theta_B$ ——— (IV)

Step - 4 → Apply eqn condition at support B -

$M_{BA} + M_{BC} = 0$

$19.5 + 0.667\,EI\theta_B - 160 + EI\theta_B = 0$

$EI\theta_B = 84.28$

Take $EI\theta_B = 84.24$ in eqn (I) - (IV)

$M_{AB} = 8.56$

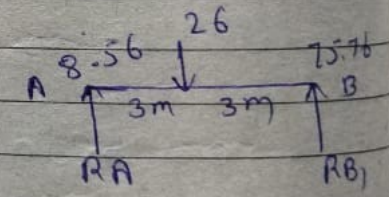
$M_{BA} = 75.76$

$M_{BC} = -75.76$

$M_{CB} = 202.12$

Step 5 → Reactions -

for span AB -



$\Sigma fy = 0$

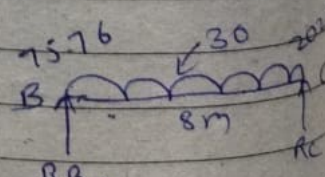
$RA + RB_1 = 26$

$RA \times 0 + 26 \times 3 - RB_1 \times 6 - 8.56 + 75.76 = 0$

$RB_1 = 24.2$

$RA = 1.8$

for span BC -



$\Sigma fy = 0, \quad RB_1 + RC = \emptyset\, 30 \times 8$

$RB_1 \times 0 + 30 \times 8 \times 4 - RC \times 8 - 75.76 + 202.12 = 0$

$RC = 135.79$

$RB_2 = 104.21$

$RB = 128.41$

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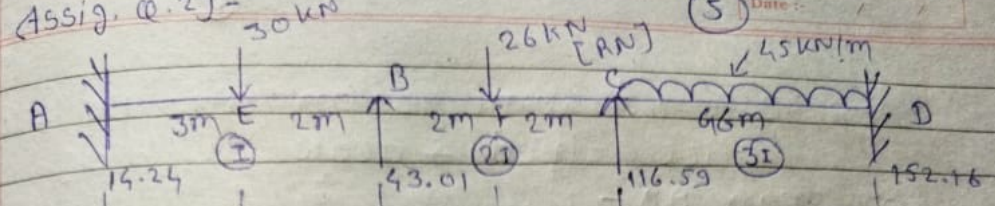
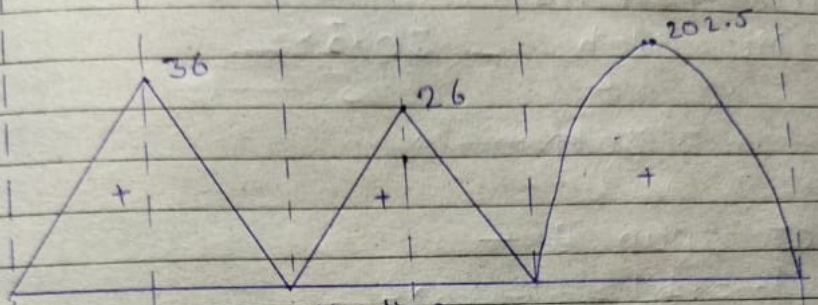
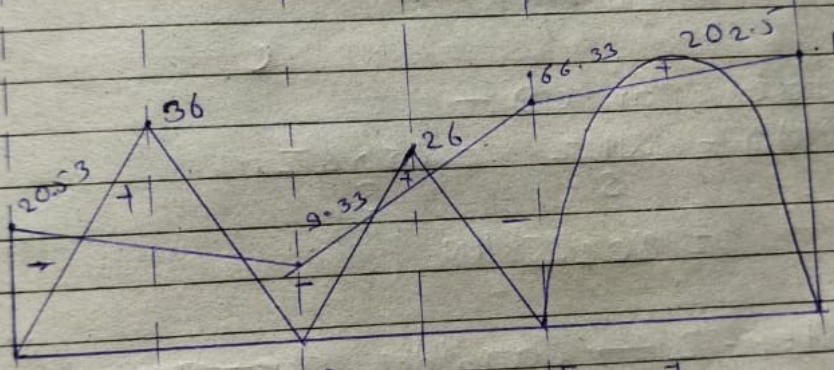
(5)

Assig. Q.2] -

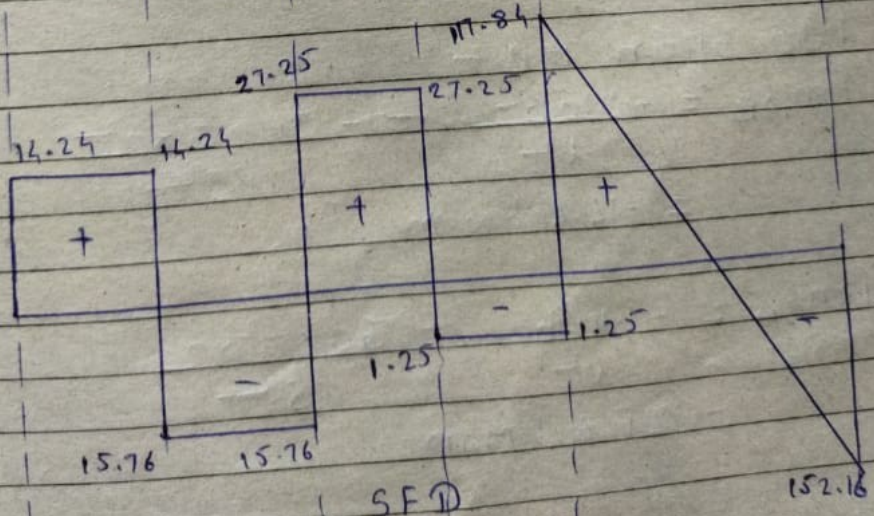




M-diag....



Final- BMD [kN.m]



SFD

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Step - 1 → Assume span AB, BC & CD are fixed & draw M diag....

For span AB -

$$M_E = \frac{Wab}{L} = \frac{30 \times 3 \times 2}{5}$$

$$= 36 \text{ kNm} \quad \text{kN}$$

For span BC -

$$M_F = \frac{WL}{4} = \frac{26 \times 4}{4}$$

$$= 26 \text{ kN}$$

For span CD -

$$M_G = \frac{WL^2}{8} = \frac{45 \times 6^2}{8}$$

$$= 202.5 \text{ kN}$$

Step - 2 → Consider each span separately & fixed end moment

For span AB -

$$fm_{AB} = -\frac{Wab^2}{l^2} = -\frac{30 \times 3 \times 2^2}{5^2}$$

$$= -14.4 \text{ kN.m}$$

$$fm_{BA} = +\frac{Wa^2b}{l^2} = \frac{30 \times 3^2 \times 2}{5^2}$$

$$= 21.6 \text{ kN.m}$$

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For span BC -

$$fm_{BC} = -\frac{WL}{8} = -\frac{26 \times 4}{8}$$

$$= -13 \text{ kN.m}$$

$$fm_{CB} = +\frac{WL}{8} = \frac{26 \times 4}{8}$$

$$= 13 \text{ kN.m}$$

For span CD -

$$fm_{CD} = -\frac{WL^2}{12} = -\frac{45 \times 6^2}{12}$$

$$= -135 \text{ kN.m}$$

$$fm_{DC} = +\frac{WL^2}{12} = \frac{45 \times 6^2}{12}$$

$$= 135 \text{ kN.m}$$

Step -3 → Formulation of Slope & deflection eqn —

$\theta A - \theta D = 0$, $\theta B + \theta C = 2$

For span AB -

$$M_{AB} = fm_{AB} + \frac{2EI}{l}[2\theta A + \theta B]$$

$$= -14.4 + \frac{2 \times 1}{5}[2\theta A + \theta B]$$

$$= -14.4 + 0.4EI\theta B \quad \text{— (I)}$$

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$$M_{BA} = fm_{BA} + \frac{2EI}{l}[\theta_A + 2\theta_B]$$

$$= 21.6 + \frac{2\times1}{5}[\theta_A + 2\theta_B]$$

$$= 21.6 + 0.8EI\theta_B \quad \text{——} (II)$$

For span BC –

$$M_{BC} = fm_{BC} + \frac{2EI}{l}[2\theta_B + \theta_C]$$

$$= -13 + \frac{2\times2}{4}[2\theta_B + \theta_C]$$

$$= -13 + 2EI\theta_B + EI\theta_C \quad \text{——} (III)$$

$$M_{CB} = fm_{CB} + \frac{2EI}{l}[\theta_B + 2\theta_C]$$

$$= 13 + \frac{2\times2}{4}[\theta_B + 2\theta_C]$$

$$= 13 + EI\theta_B + 2EI\theta_C \quad \text{——} (IV)$$

For span CD —

$$M_{CD} = fm_{CD} + \frac{2EI}{l}[2\theta_C + \theta_D]$$

$$= -135 + \frac{2\times3}{6}[2\theta_C + \theta_D]$$

$$= -135 + 2EI\theta_C \quad \text{——} (V)$$

$$M_{DC} = fm_{DC} + \frac{2EI}{l}[\theta_C + 2\theta_D]$$

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$= 135 + \frac{2 \times 3}{6} [\theta_C + 2\theta_D]$

$= 135 + EI\theta_C$ ——— (VI)

Step - 4 → Apply eqn condition -
at joint B -

$M_{BA} + M_{BC} = 0$

$21.6 + 0.8EI\theta_B + 13 + 2EI\theta_B + EI\theta_C = 0$

$2.8EI\theta_B + EI\theta_C = -8.6$ — (A)

at joint C -

$M_{CB} + M_{CD} = 0$

$13 + EI\theta_B + 2EI\theta_C + 135 + 2\theta EI\theta_C = 0$

$EI\theta_B + 4EI\theta_C = 122$ — (B)

$EI\theta_B = -15.33$

$EI\theta_C = 34.33$

Take a value in eqn (I) - (VI)

$M_{AB} = -20.53$ kN.m

$M_{BA} = 9.33$ kN.m

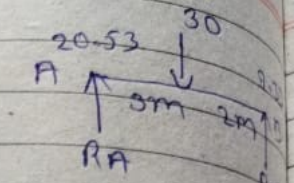
$M_{BC} = -9.33$ kN.m

$M_{CB} = 66.33$ kN.m

$M_{CD} = 66.34$ kN.m

$M_{DC} = 169.33$ kN.m

Step - 5 → Reactions -



For span AB -

$\Sigma fy = 0$

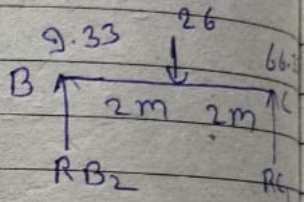
$RA + RB_1 = 30$

$\Sigma MA = 0$

$RA \times 0 + 30 \times 3 - RB_1 \times 5 - 20.53 + 9.33 = 0$

$RB_1 = 15.76$

$RA = 14.24$



For span BC -

$\Sigma fy = 0$

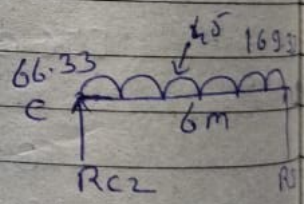
$RB_2 + RC_1 = 26$

$\Sigma MB = 0$

$RB_2 \times 0 + 26 \times 2 - RC_1 \times 4 - 9.33 + 66.33 = 0$

$RB_2 = 27.25$

$RC_1 = -1.25$



For span CD -

$\Sigma fy = 0$

$RC_2 + RD = 45 \times 6$

$\Sigma MC = 0$

$RC_2 \times 0 + 45 \times 6 \times 3 - RD \times 6 - 66.33 + 169.33 = 0$

$RD = 152.16$

$RC_2 = 117.84$

$RA = 14.24$

$RB = 43.01$

$RC = 116.59$

$RD = 152.16$

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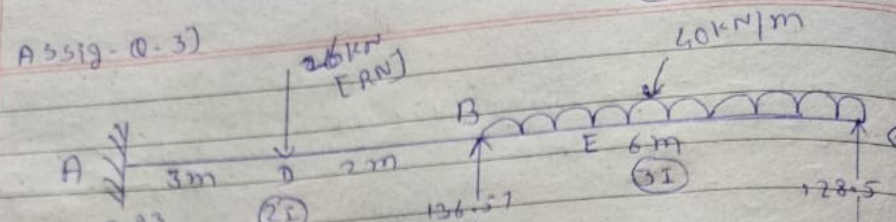
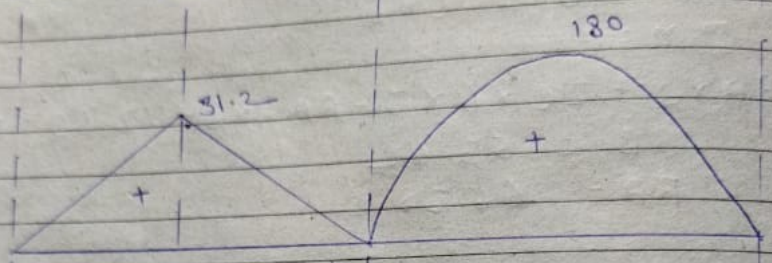
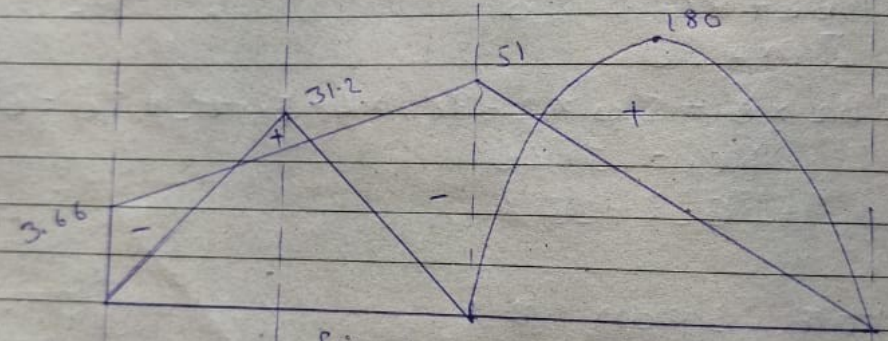
Assig - (Q - 3)

3)

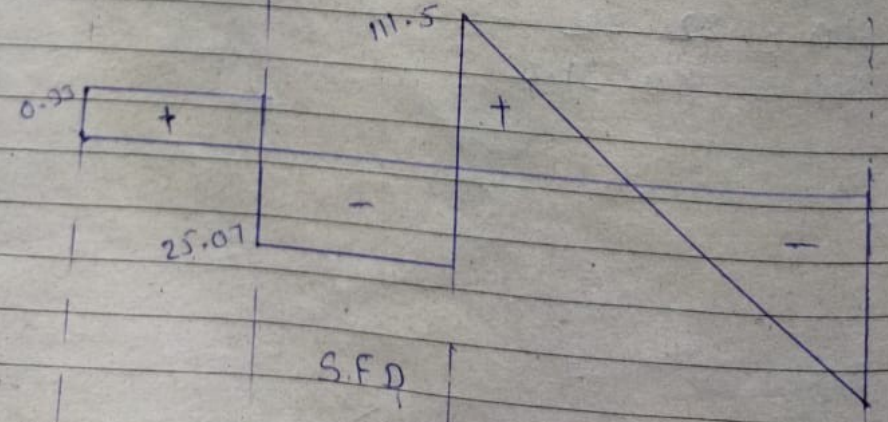




M- diagram



Final BMD [kN.m]



S.F.D

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Step-1 - Assume span AB & BC

For span AB

$MD = \frac{Wab}{l} = \frac{26 \times 3 \times 2}{5}$

$= 31.2 \text{ kN}$

For span BC -

$MD = \frac{Wl^2}{8} = \frac{60 \times 6^2}{8}$

$= 180 \text{ kN}$

Step-2 ⟶ Fixed end moment

For span AB

$FmAB = -\frac{Wab^2}{l^2} = -\frac{26 \times 3 \times 2^2}{5^2}$

$= -12.48$

$FmBA = +\frac{Wa^2b}{l^2} = \frac{26 \times 3^2 \times 2}{5^2}$

$= 18.72$

For span BC

$FmBC = -\frac{Wl^2}{12} = -\frac{26 \times 5^2}{12}$

$= -54.17$

$FmCB = +\frac{Wl^2}{12} = \frac{26 \times 5^2}{12}$

$= 54.17$

(B)

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step-3 -> Formulation of slope - deflection eqn.

$\theta A = 0$

For span AB -

$M_{AB} = FM_{AB} + \frac{2EI}{l}[2\theta A + \theta B]$

$= -12.48 + \frac{2 \times 2}{5}[2\theta A + \theta B]$

$= -12.48 + 0.8EI\theta B$ —— (I)

$M_{BA} = FM_{BA} + \frac{2EI}{l}[\theta A + 2\theta B]$

$= 18.72 + \frac{2 \times 2}{5}[\theta A + 2\theta B]$

$= 18.72 + 1.6EI\theta B$ —— (II)

For span BC

$M_{BC} = FM_{BC} + \frac{2EI}{l}[2\theta B + \theta C]$

$= -54.17 + \frac{2 \times 3}{6}[2\theta B + \theta C]$

$= -54.17 + 2EI\theta B + EI\theta C$ —— (III)

$M_{CB} = FM_{CB} + \frac{2EI}{l}[\theta B + 2\theta C]$

$= 54.17 + \frac{2 \times 3}{6}[\theta B + 2\theta C]$

$= 54.17 + EI\theta B + 2EI\theta C$ —— (IV)

Step-4 -> Apply eqn condition

at joint B -

$M_{BA} + M_{BC} = 0$

$18.72 + 1.6EI\theta_B - 54.17 + 2EI\theta_B + EI\theta_C = 0$

$3.6EI\theta_B + EI\theta_C = 35.45$ — (A) (A)

at joint C —

$M_{CB} = 0$

$54.17 + EI\theta_B + 2EI\theta_C = 0$

$EI\theta_B + 2EI\theta_C = -54.17$ — (B)

$EI\theta_B = 20.17$

$EI\theta_C = -37.17$

Take a value in eqn (I) - (IV)

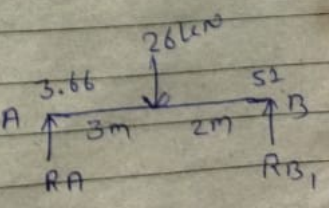
$M_{AB} = 3.66$

$M_{BA} = 51$

$M_{BC} = -51$

$M_{CB} = 0$

Step - 5 —> Reactions



for span AB

$\Sigma fy = 0$

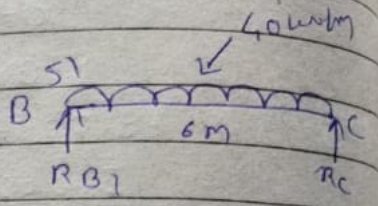
$R_A + R_{B_1} = 26$

$\Sigma M_A = 0$

$R_A \times 0 + 26 \times 3 - R_{B_1} \times 5 - 3.66 + 51 = 0$

$R_{B_1} = 25.07$

$R_A = 0.93$



For span BC

$\Sigma f_y = 0$

$R_{B_1} + R_C = 40 \times 6$

$\Sigma M_B = 0$

$R_{B_2} \times 0 + 40 \times 6 \times 3 - R_C \times 6 - 51 = 0$

$R_C = 111.5$

$R_{B_2} = 128.5$

$R_A = 0.93$

$R_B = 136.57$

$R_C = 128.5$

Assig- Q.4]

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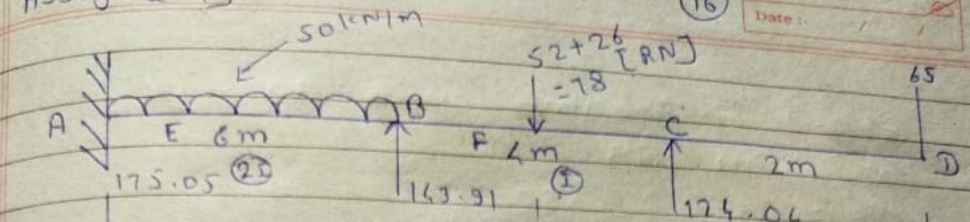
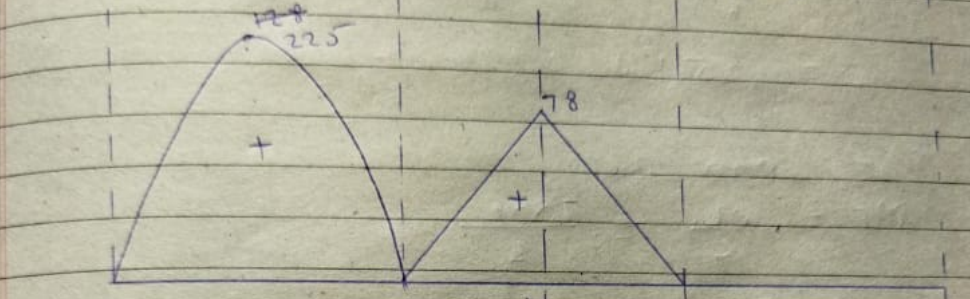
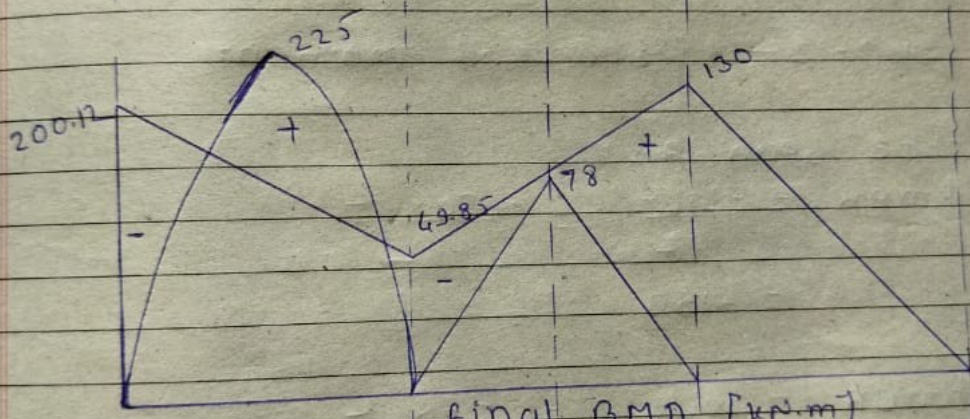
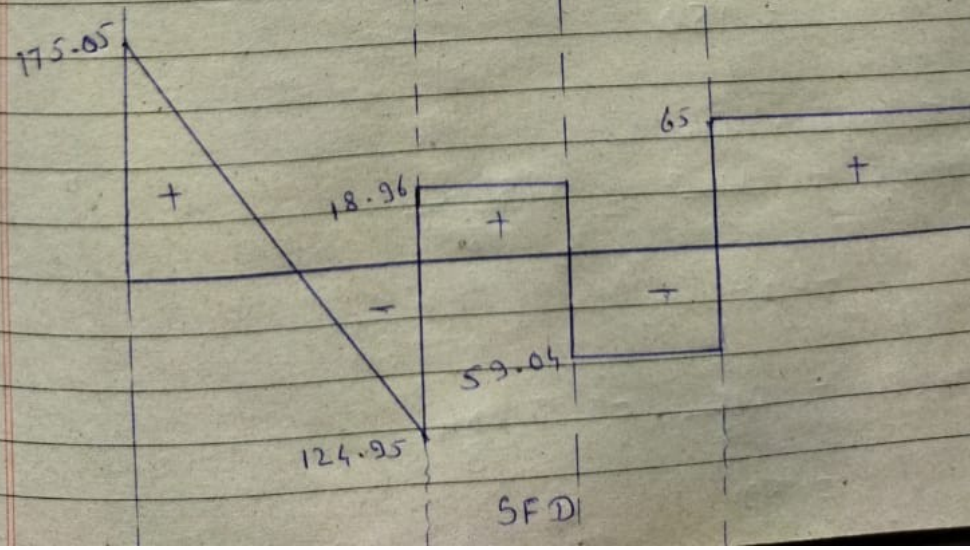




M- diagram



final BMD [kN.m]



SFD

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Step-1 → Assume Span AB & BC

For span AB

$$M_E = \frac{WL^2}{8} = \frac{50 \times 6^2}{8}$$

$$= 225 \text{ kN}$$

For span BC

$$M_F = \frac{WL}{4} = \frac{78 \times 4}{4}$$

$$= 78 \text{ kN}$$

Step-2 → Fixed end moment

For span AB

$$FmAB = \frac{-WL^2}{12} = -\frac{50 \times 6^2}{12}$$

$$= -150$$

$$FmBA = \frac{WL^2}{12} = \frac{50 \times 6^2}{12}$$

$$= 150$$

For span BC

$$FmBC = \frac{-WL}{8} = \frac{-78 \times 4}{8}$$

$$= -39$$

$$FmCB = \frac{WL}{8} = \frac{78 \times 4}{8}$$

$$= 39$$

for span CD.

$M_{CD} = fm_{CD} = -65 \times 2$

$= -130$ kN.m

Step - 3 → formulation of slope deflection eqn.

$\theta A = 0$

for span AB

$M_{AB} = fm_{AB} + \frac{2EI}{l} [2\theta A + \theta B]$

$= -150 + \frac{2 \times 2}{6} [2\theta A + \theta B]$

$= -150 + 1.333 EI\theta A + 0.667 EI\theta B$ — (I)

$M_{BA} = fm_{BA} + \frac{2EI}{l} [\theta A + 2\theta B]$

$= 150 + \frac{2 \times 2}{6} [\theta A + 2\theta B]$

$= 150 + 1.333 EI\theta B$ — (II)

for span BC

$M_{BC} = fm_{BC} + \frac{2EI}{l} [2\theta B + \theta C]$

$= -39 + \frac{2 \times 1}{4} [2\theta B + \theta C]$

$= -39 + EI\theta B + 0.5 EI\theta C$ — (III)

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$$M_{CB} = FM_{CB} + \frac{2EI}{L}[\theta_B + 2\theta_C]$$

$$= 39 + \frac{2 \times 1}{4}[\theta_B + 2\theta_C]$$

$$= 39 + 0.5EI\theta_B + EI\theta_C \quad \text{——(IV)}$$

step-4 → Apply eqn condition

at joint B

$M_{BA} + M_{BC} = 0$

$150 + 1.333EI\theta_B - 39 + EI\theta_B + 0.5EI\theta_C = 0$

$2.333 + 0.5EI\theta_C = -111$ —(A)

at joint C

$M_{CB} + M_{CD} = 0$

$39 + 0.5EI\theta_B + EI\theta_C - 130 = 0$

$0.5EI\theta_B + EI\theta_C = 91$ —(B)

$EI\theta_B = -75.13$

$EI\theta_C = 128.56$

Take a value in eqn (I) - (IV)

$M_{AB} = -200.12$ kN.m

$M_{BA} = 49.85$ kN.m

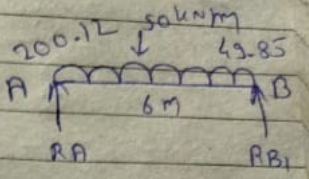
$M_{BC} = -49.85$ kN.m

$M_{CB} = +129.99 \approx 130$ kN.m

$M_{CD} = -130$ kN.m

Step- 5 → Reactions.

For Span AB



$\Sigma fy = 0$

$RA + RB_1 = 50 \times 6$

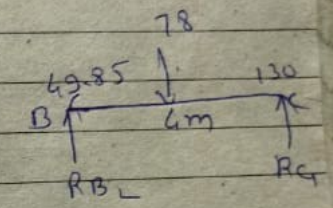
$\Sigma MA = 0$

$RA \times 0 + 50 \times 6 \times 3 - RB_1 \times 6 - 200.12 + 49.85 = 0$

$RB_1 = 124.95$

$RA = 175.05$

For Span BC



$\Sigma fy = 0$

$RB_2 + RC_1 = 78$

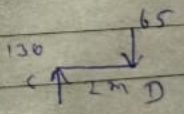
$\Sigma MB = 0$

$RB_2 \times 0 + 78 \times 2 - RC_1 \times 4 - 49.85 + 130 = 0$

$RC_1 = 59.04$

$RB_2 = 18.96$

For Span CD



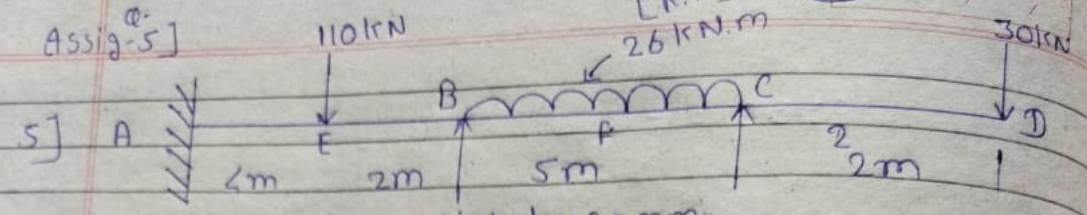
$RC_2 = 65$

$RA = 175.05$

$RB = 163.91$

$RC = 124.04$

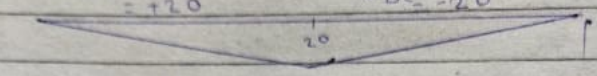
Assig-5] Q.

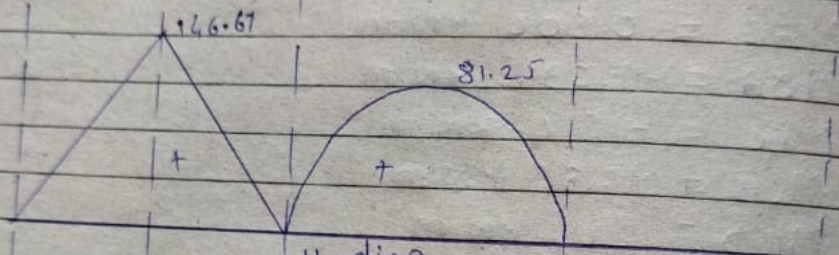


sink by 20mm

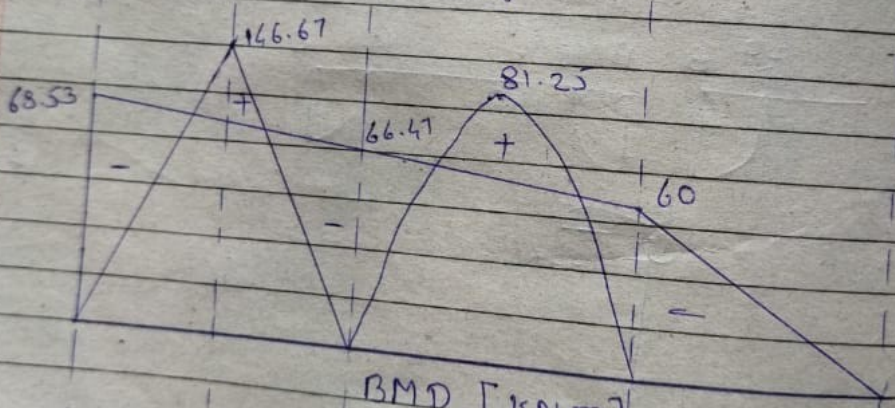
$\Delta_{AB} = 20 - 0 = +20$

$\Delta_{BC} = 20 - 0 = -20$

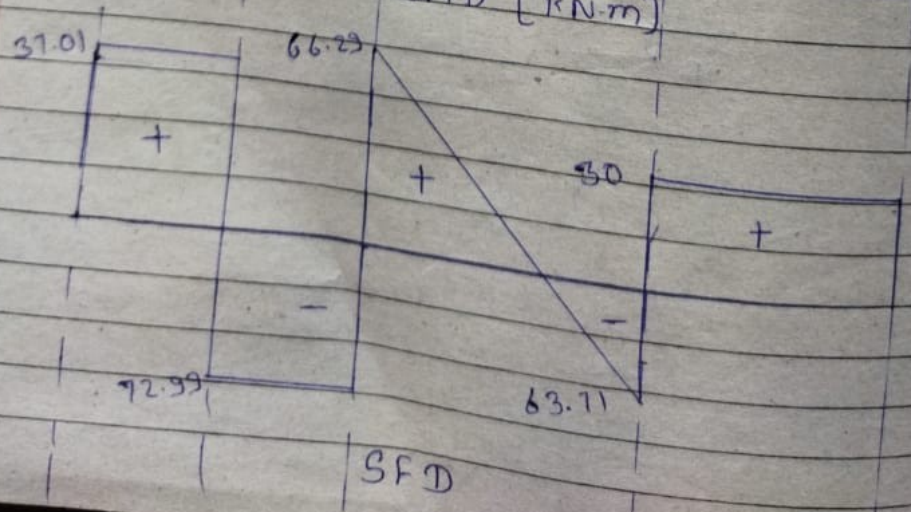




M- diag...



BMD [kN-m]



SFD

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Step-1 → Assume span AB & BC

For span AB

$ME = \frac{Wab}{L} = \frac{110 \times 4 \times 2}{6}$

$= 146.67 \text{ kN}$

For span BC

$M_F = \frac{WL^2}{8} = \frac{26 \times 5^2}{8}$

$= 81.25 \text{ kN}$

Step - 2 → fixed end moment

For span AB

$fmAB = -\frac{Wab^2}{L^2} = -\frac{110 \times 4 \times 2^2}{6^2}$

$= -48.89 \text{ kN.m}$

$fmBA = +\frac{Wa^2b}{L^2} = \frac{110 \times 4^2 \times 2}{6^2}$

$= +97.78 \text{ kN.m}$

For span BC

$fmBC = -\frac{WL^2}{12} = -\frac{26 \times 5^2}{12}$

$= -54.17 \text{ kN.m}$

$fmCB = +\frac{WL^2}{12} = \frac{26 \times 5^2}{12}$

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For span CD

$M_{CD} = fm_{CD} = -30 \times 2$

$= -60$ kN.m

Step-3 → Formulation of slope deflection

$\theta A = 0$

For span AB

$M_{AB} = fm_{AB} + \frac{2EI}{L}\left[2\theta A + \theta B - \frac{3\Delta}{L}\right]$

$= -48.89 + \frac{2EI}{6}\left[2\theta A + \theta B - \frac{3\Delta}{L}\right]$

$= -48.89 + 0.333\theta B - \frac{6EI\Delta AB}{L^2}$

$= -48.89 + 0.33\theta B - \frac{6 \times 200 \times 10^5 \times 120 \times 10^{-6} \times 20 \times 10^{-3}}{6^2}$

$= -48.89 + 0.333\theta B - 8$

$= -56.89 + 0.333EI\theta B$ — (I)

$M_{BA} = fm_{BA} + \frac{2EI}{L}\left[\theta A + 2\theta B - \frac{3\Delta}{L}\right]$

$= 97.78 + \frac{2EI}{6}\left[\theta A + 2\theta B - \frac{3\Delta}{L}\right]$

$= 97.78 + 0.667\theta B - \frac{6EI\Delta AB}{L^2}$

$= 97.78 + 0.667\theta B - \frac{6 \times 200 \times 10^5 \times 120 \times 10^{-6} \times 20 \times 10^{-3}}{6^2}$

$= 97.78 + 0.667\theta B - 8$

$= 89.78 + 0.667\ EI\theta B$ — (II)

for span BC

$M_{BC} = fm_{BC} + \frac{2EI}{L}\left[2\theta B + \theta C - \frac{3\Delta}{L}\right]$

$= -54.17 + \frac{2EI}{5}\left[2\theta B + \theta C - \frac{3\Delta}{L}\right]$

$= -54.17 + 0.8\theta B + 0.4\theta C - \frac{6EI\Delta BC}{L^2}$

$= -54.17 + 0.8\theta B + 0.4\theta C - \frac{6 \times 200 \times 10^5 \times 120 \times 10^{-6} \times -20 \times 10^{-3}}{5^2}$

$= -54.17 + 0.8\theta B + 0.4\theta C - (-11.52)$

$= -54.17 + 0.8\theta B + 0.4\theta C + 11.52$

$= -42.65 + 0.8\theta B + 0.4\theta C$ — (III)

$M_{CB} = fm_{CB} + \frac{2EI}{L}\left[\theta B + 2\theta C - \frac{3\Delta}{L}\right]$

$= 54.17 + \frac{2EI}{5}\left[\theta B + 2\theta C - \frac{3\Delta}{L}\right]$

$= 54.17 + 0.4\theta B + 0.8\theta C - \frac{6EI\Delta BC}{L^2}$

$= 54.17 + 0.4\theta B + 0.8\theta C - \frac{6 \times 200 \times 10^5 \times 120 \times 10^{-6} \times -20 \times 10^{-3}}{5^2}$

$= 54.17 + 0.4\theta B + 0.8\theta C - (-11.52)$

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$= 56.17 + 0.6\theta B + 0.8\theta C + 11.52$

$= 65.69 + 0.6EI\theta B + 0.8EI\theta C$ —— (IV)

Step - 6 → Apply eqn condition

At joint B

$M_{BA} + M_{BC} = 0$

$899.78 + 0.667 EI\theta B - 62.65 + 0.8 EI\theta B + 0.6EI\theta C = 0$

$1.467 EI\theta B + 0.6EI\theta C = -67.13$ —— (A)

At joint C

$M_{CB} + M_{CD} = 0$

$65.69 + 0.6EI\theta B + 0.8EI\theta C - 60 = 0$

$0.6EI\theta B + 0.8EI\theta C = -5.69$ —— (B)

Take a value

$EI\theta B = -34.95$

$EI\theta C = 10.36$

$M_{AB} = -68.53$

$M_{BA} = 66.47$

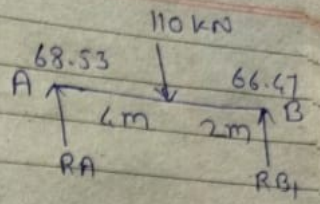
$M_{BC} = -66.47$

$M_{CB} = 60$

$M_{CD} = -60$

Step - 5 → Reaction

For span AB



$\Sigma fy = 0$

$RA + RB_1 = 110$

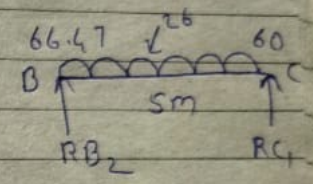
$\Sigma M_A = 0$

$RA \times 0 + 110 \times 4 - RB_1 \times 6 - 68.53 + 66.47 = 0$

$RB_1 = 72.99$

$RA = 37.01$

For span BC



$\Sigma fy = 0$

$RB_2 + RC_1 = 26 \times 5$

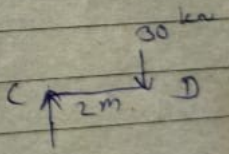
$\Sigma M_B = 0$

$RB_2 \times 0 + 26 \times 5 \times 2.5 - RC_1 \times 5 - 66.47 + 60 = 0$

$RC_1 = 63.71$

$RB_2 = 66.29$

For span CD



$RC_2 = 30$

$RA = 37.01$

$RB = 139.28$

$RC = 93.71$

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Assig-(Q.6)

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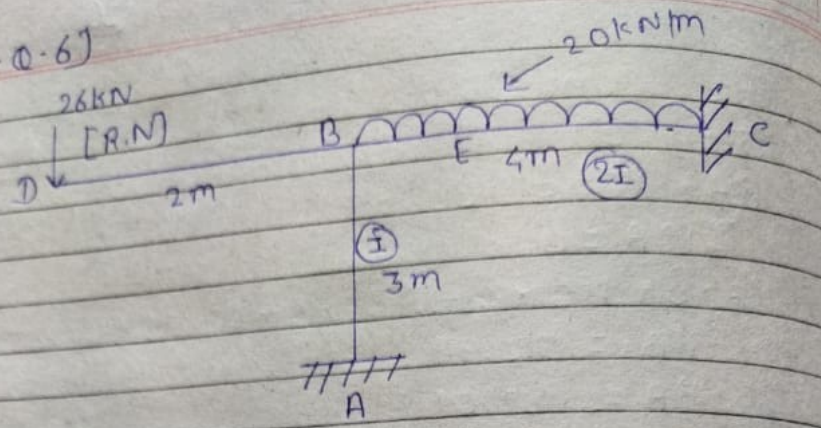

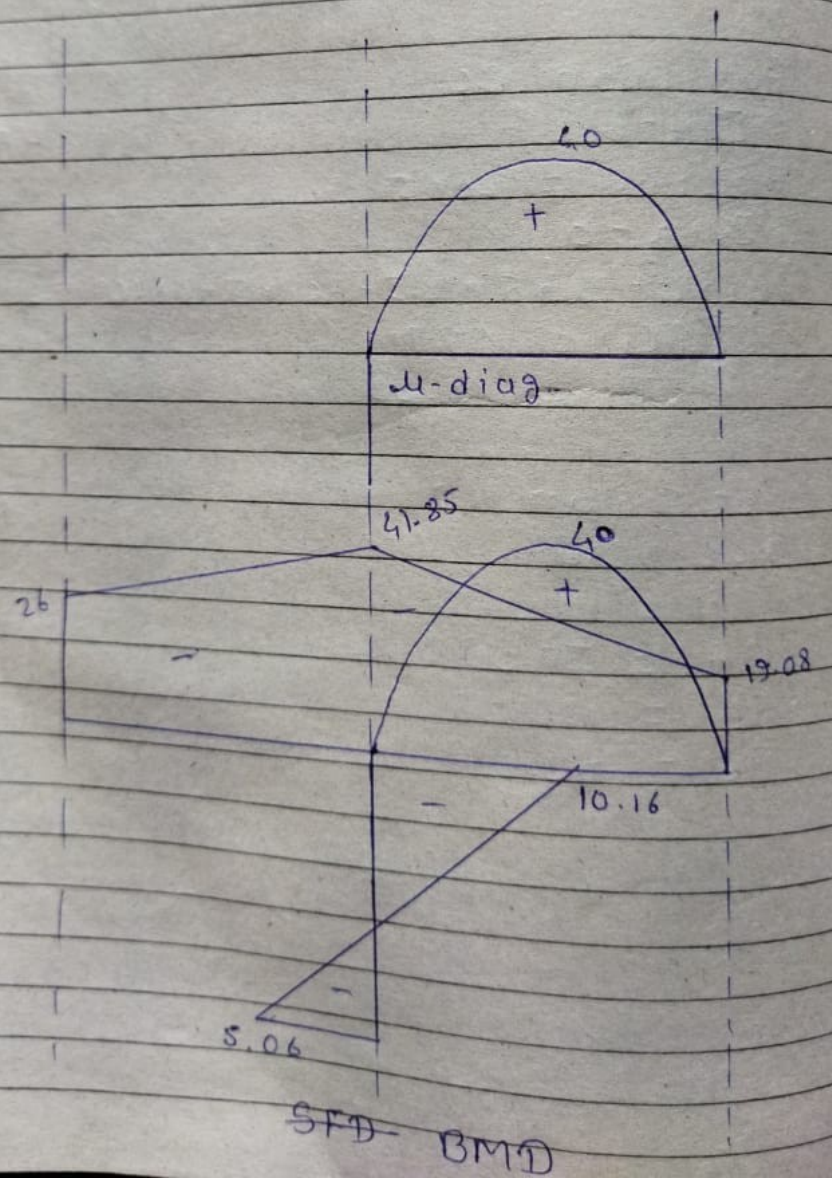

Step - 1 ⟶ Assume span BC

$ME = \frac{WL^2}{8} = \frac{20 \times 4^2}{8}$

$= 40$ kN.

Step - 2 ⟶ Fixed end moment

For span AB

$FmAB = 0 = FmBA = 0$

For span BC

$FmBC = -\frac{WL^2}{12} = -\frac{20 \times 4^2}{12}$

$= -26.67$ kN.m

$FmCB = +\frac{WL^2}{12} = \frac{20 \times 4^2}{12}$

$= 26.67$ kN.m

For span BD

$MBD = FmBD = +26 \times 2$

$= 52$ kN.m

Step - 3 ⟶ Formulation of slope & deflection

For span AB

$MAB = FmAB + \frac{2EI}{L} [2\theta A + \theta B]$

$= 0 + \frac{2 \times I}{3} [2\theta A + \theta B]$

$M_{AB} = 0.667 EI\theta B$ —— (I)

$M_{BA} = fm_{BA} + \frac{2EI}{L} [\theta A + 2\theta B]$

$= 0 + \frac{2 \times I}{3} [\theta A + 2\theta B]$

$M_{BA} = 1.333 EI\theta B$ —— (II)

For span BC

$M_{BC} = fm_{BC} + \frac{2EI}{L} [2\theta B + \theta C]$

$= -26.67 + \frac{2 \times 2}{4} [2\theta B + \theta C]$

$= -26.67 + 2EI\theta B$ —— (III)

$M_{CB} = fm_{CB} + \frac{2EI}{L} [\theta B + 2\theta C]$

$= 26.67 + \frac{2 \times 2}{4} [\theta B + 2\theta C]$

$= 26.67 + EI\theta B$ —— (IV)

Step - 4 ⟶ Apply eqn condition

At joint B

$M_{BA} + M_{BC} + M_{BD} = 0$

$1.333 EI\theta B + 26.67 + 2EI\theta B + 52 = 0$

$3.333 EI\theta B = -25.33$

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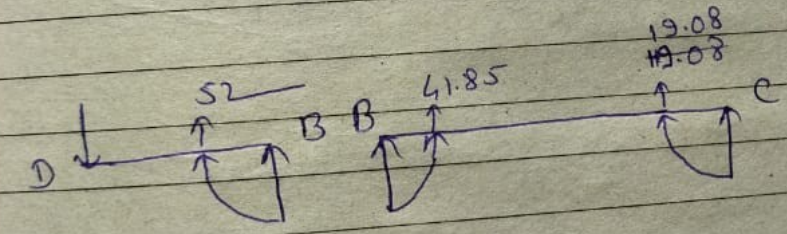
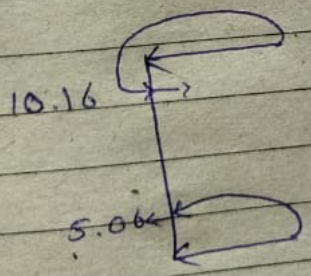
$EI\theta B = \frac{-25.33}{3.333}$

$EI\theta B = -7.59$

Take A value in eqn (I) - (IV)

MAB = -5.06
MBA = -10.16
MBC = -41.85
MCB = 19.08
MBD = 52





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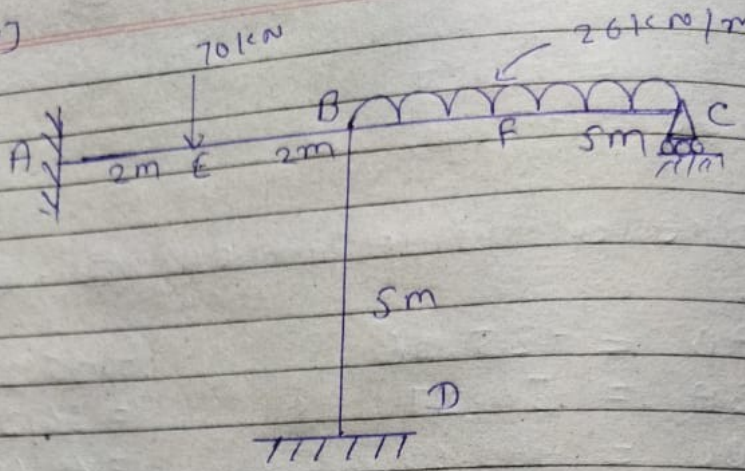

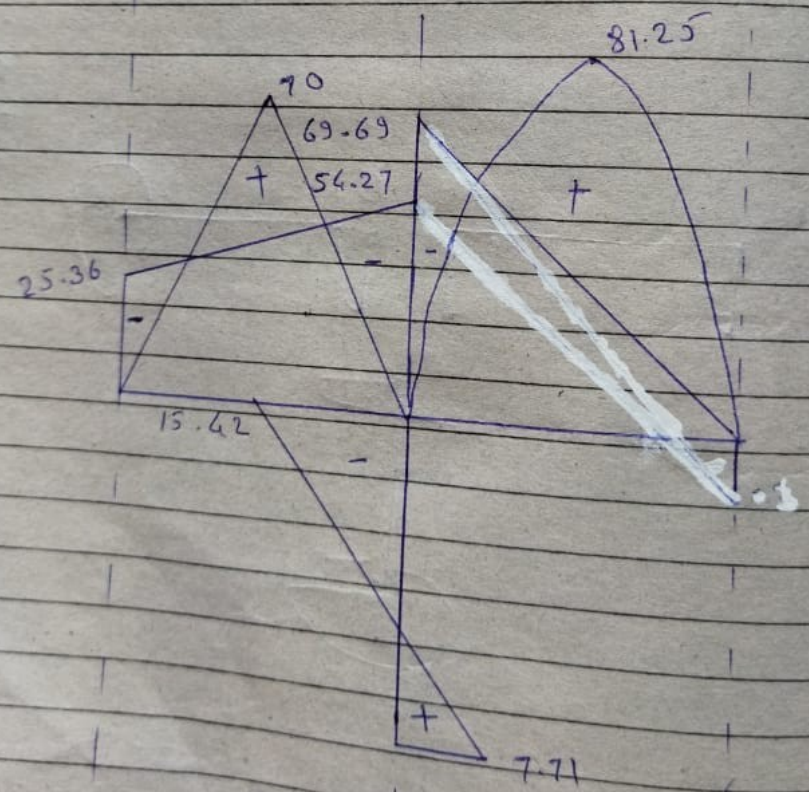

BMD [kN.m]

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Step - 1 → Assume span AB & BC

for span AB

$MF = \frac{WL}{4} = \frac{70 \times 4}{4}$

$= 70 kN$

for span BC

$MF = \frac{WL^2}{8} = \frac{26 \times 5^2}{8}$

$= 81.25 kN$

Step - 2 → Fixed end moment

for span AB

$FmAB = -\frac{WL}{8} = -\frac{70 \times 4}{8}$

$= -35$

$FmBA = \frac{WL}{8} = \frac{70 \times 4}{8}$

$= 35$

for span BC

$FmBC = -\frac{WL^2}{12} = -\frac{26 \times 5^2}{12}$

$= -54.17$

$FmCB = +\frac{WL^2}{12} = \frac{26 \times 5^2}{12}$

$= 54.17$

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For Span BD

$FM_{BD} = FM_{DB} = 0$

Step-3 ⟶ Formulation of slope & deflection

$\theta A = \theta D = 0$

For Span AB

$M_{AB} = FM_{AB} + \frac{2EI}{L}[2\theta A + \theta B]$

$= -35 + \frac{2 \times I}{4}[2\theta A + \theta B]$

$= -35 + 0.5EI\theta B$ —— (I)

$M_{BA} = FM_{BA} + \frac{2EI}{L}[\theta A + 2\theta B]$

$= 35 + \frac{2 \times I}{4}[\theta A + 2\theta B]$

$= 35 + EI\theta B$ —— (II)

For Span BC

$M_{BC} = FM_{BC} + \frac{2EI}{L}[2\theta B + \theta C]$

$= -54.17 + \frac{2 \times I}{5}[2\theta B + \theta C]$

$= -54.17 + 0.8EI\theta B + 0.4EI\theta C$ — (III)

$M_{CB} = FM_{CB} + \frac{2EI}{L}[\theta B + 2\theta C]$

$= 54.17 + \frac{2 \times I}{5}[\theta B + 2\theta C]$

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$= 54.17 + 0.4EI\theta B + 0.8EI\theta C$ —— (IV)

for span DB

$M_{DB} = fm_{DB} + \frac{2EI}{L}[2\theta D + \theta B]$

$= 0 + \frac{2 \times I}{5}[2\theta D + \theta B]$

$= 0.4EI\theta B$ —— (V)

$M_{BD} = fm_{BD} + \frac{2EI}{L}[\theta D + 2\theta B]$

$= 0 + \frac{2 \times I}{5}[\theta D + 2\theta B]$

$= 0.8EI\theta B$ —— (VI)

Step – 4 ⟶ Apply eqn condition

At joint B

$M_{BA} + M_{BC} + M_{BD} = 0$

$35 + EI\theta B - 54.17 + 0.8EI\theta B + 0.4EI\theta C = 0$

$+ 0.8EI\theta B = 0$

$2.6EI\theta B + 0.4EI\theta C = 19.17$ —— (A)

At joint C

$M_{CB} = 0$

$54.17 + 0.4EI\theta B + 0.8EI\theta C = 0$

$0.4EI\theta B + 0.8EI\theta C$

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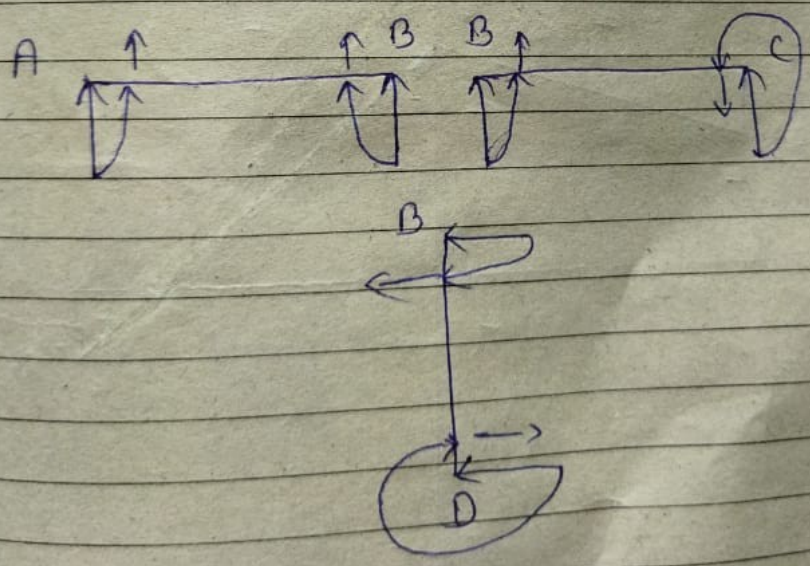
$EI\theta B = 19.27$
$EI\theta C = -77.35$

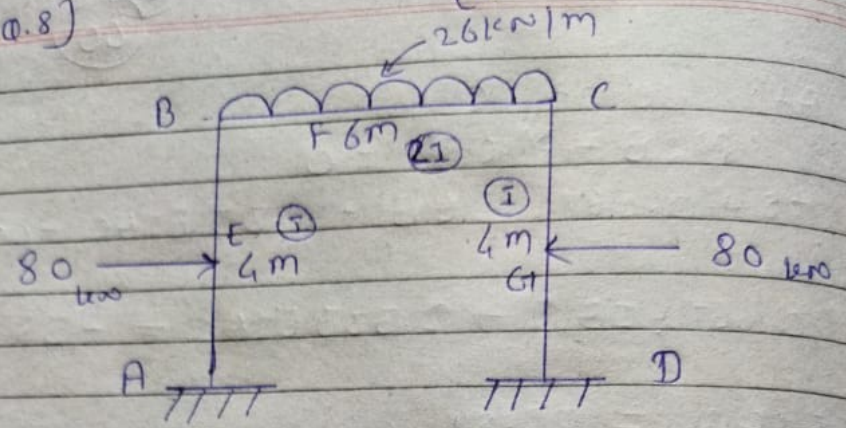
Take a value in eqn (I) - (VI)

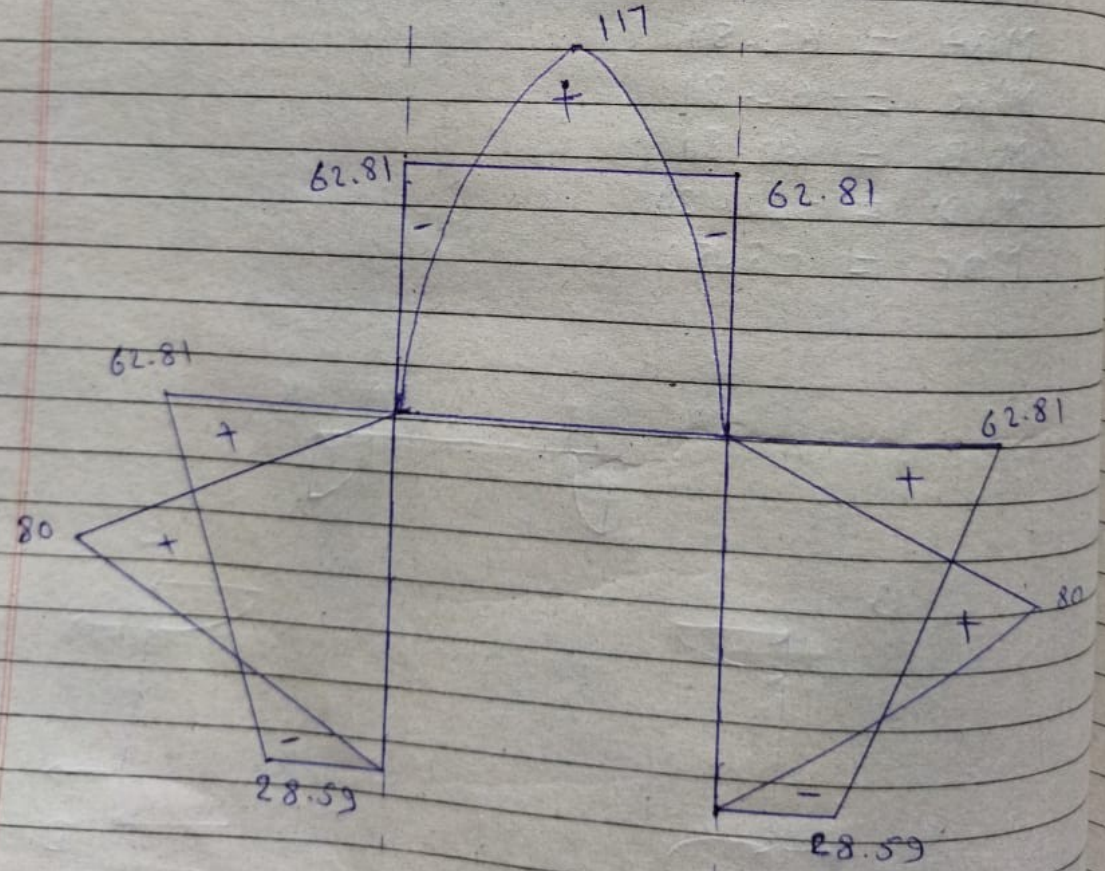
$MAB = -25.36$ $= 25.365$
$MBA = 54.27$ $= 54.27$
$MBC = -69.69$ $= 69.694$
$MCB = -108.34 - 2\times10^{-3}$ -2×10^{-3} → If there is something ees to the power $-3,-6$ = then it should be 0.
$MBD = 15.42$
$MDB = 7.71$



Assig. Q.8]

Q.8]





BMD [kN.m]

Step - 1 ⟶ Assume span AB, BC, CD

For Span BC

$M_f = \frac{WL^2}{8} = \frac{26 \times 6^2}{8}$

$= 117$ KN

For Span AB & CD

$M_E \& M_G = \frac{WL}{4} = \frac{80 \times 4}{4}$

$= 80$ KN

Step - 2 ⟶ Fixed end moment

For Span AB

$f_{mAB} = -\frac{WL}{8} = -\frac{80 \times 4}{8}$

$= -40$

$f_{mBA} = +\frac{WL}{8} = \frac{80 \times 4}{8}$

$= 40$

For Span BC

$f_{mBC} = -\frac{WL^2}{12} = -\frac{26 \times 6^2}{12}$

$= -78$

$f_{mCB} = +\frac{WL^2}{12} = \frac{26 \times 6^2}{12}$

$= 78$

For span CD

$$fm_{CD} = \frac{-wl}{8} = \frac{-80 \times 4}{8}$$

$$= -40$$

$$fm_{DC} = \frac{+wl}{8} = \frac{80 \times 4}{8}$$

$$= 40$$

Step - 3 → Slope & deflection eqn

$\theta A = \theta D = 0$

For span AB

$$M_{AB} = fm_{AB} + \frac{2EI}{l}[2\theta A + \theta B]$$

$$= -40 + \frac{2 \times 1}{4}[2\theta A + \theta B]$$

$$= -40 + 0.5 EI\theta B \quad \text{——} (I)$$

$$M_{BA} = fm_{BA} + \frac{2EI}{l}[\theta A + 2\theta B]$$

$$= 40 + \frac{2 \times 1}{4}[\theta A + 2\theta B]$$

$$= 40 + EI\theta B \quad \text{——} (II)$$

For span BC

$$M_{BC} = fm_{BC} + \frac{2EI}{l}[2\theta B + \theta C]$$

$$= -78 + \frac{2 \times 2}{6}[2\theta B + \theta C]$$

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$= -78 + 1.333 EI\theta B + 0.667 EI\theta C$ — (III)

$M_{CB} = fm_{CB} + \frac{2EI}{L} [\theta B + 2\theta C]$

$= 78 + \frac{2 \times 2}{6} [\theta B + 2\theta C]$

$= 78 + 0.667 EI\theta B + 1.333 EI\theta C$ — (IV)

For span CD

$M_{CD} = fm_{CD} + \frac{2EI}{L} [2\theta C + \theta D]$

$= -40 + \frac{2 \times I}{4} [2\theta C + \theta D]$

$= -40 + EI\theta C$ — (V)

$M_{DC} = fm_{DC} + \frac{2EI}{L} [\theta C + 2\theta D]$

$= 40 + \frac{2 \times I}{4} [\theta C + 2\theta D]$

$= 40 + 0.5 EI\theta C$ — (VI)

Step-4 ⟶ Apply eqn condition

At Joint B

$M_{BA} + M_{BC}$

$40 + EI\theta B - 78 + 1.333 EI\theta B + 0.667 EI\theta C = 0$

$2.333 EI\theta B + 0.667 EI\theta C = 38$ — (A)

At joint C

$M_{CB} + M_{CD} = 0$

$7.8 + 0.667 EI\theta_B + 1.333 EI\theta_C - 40 + EI\theta_C = 0$

$0.667 EI\theta_B + 2.333 EI\theta_C = -38$ ——— (B)

$EI\theta_B = 22.81$

$EI\theta_C = -22.81$

$M_{AB} = -28.59$

$M_{BA} = 62.81$

$M_{BC} = -62.81$

$M_{CB} = 62.81$

$M_{CD} = -62.81$

$M_{DC} = 28.59$