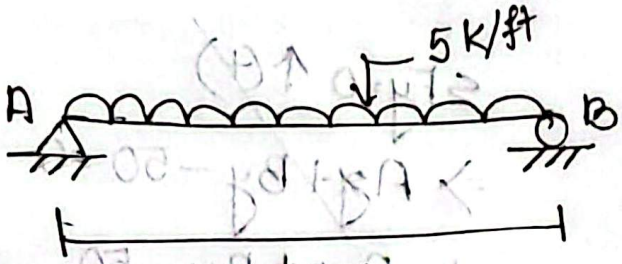
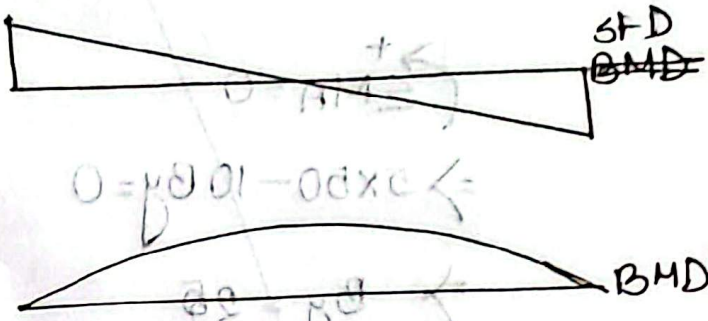
Lec-01

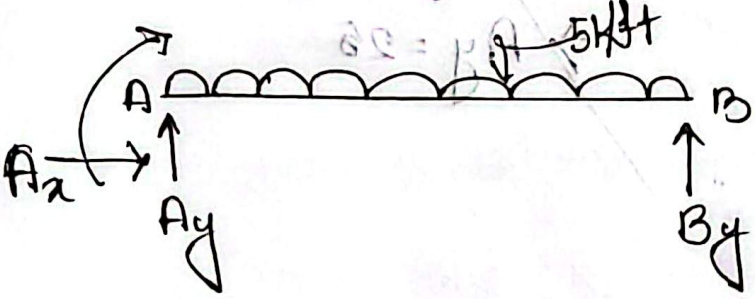
18.06.26

Noor Sir

(1)







$\Sigma F_x = 0 \rightarrow (+)$

$\Rightarrow A_x = 0$

$\overset{+}{\circlearrowleft} \Sigma M_A = 0$

$\Rightarrow 5 \times 50 - 10 B_y = 0$

$\Rightarrow -10 B_y = -50$

$\Rightarrow B_y = 25$

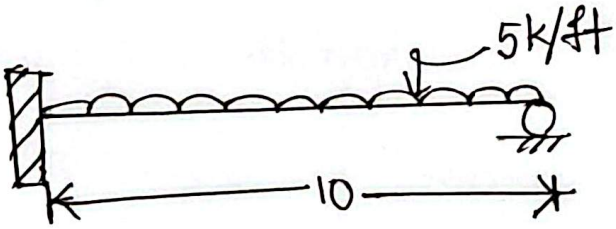
$\Sigma F_y = 0 \uparrow (+)$

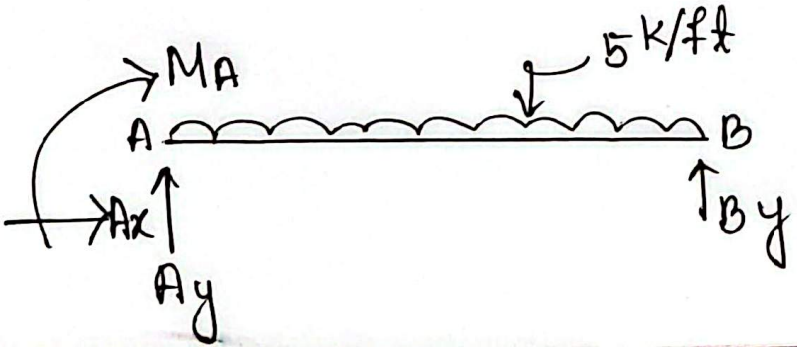
$\Rightarrow A_y + B_y - 5 \times 10 = 0$

$\Rightarrow A_y + B_y = 50$

$\Rightarrow A_y = 25$

(2)





$\Sigma M_B = 0$ (+)

$\Rightarrow -M_A - 10A_y + 5 \times 50$

Equillibrium eqn $\Rightarrow$ $\Sigma F_x = 0$

$\Sigma F_y = 0$

$\Sigma M = 0$

$3m + r = 3 \times 1 + 4 = 7$

$3j + c = 3 \times 2 = 6$

degree = 1° indeterminarte

Moment distribution method

Math will be from 1° to 3°

Assumption ⇒ rigid joints (beam-colm joint)

K = stiffness of $\theta = \frac{4EI}{L}$

moment = $K\theta = \frac{4EI}{L}\theta$

ΣM = Σ all member moment = $\theta \Sigma K$

at far end K = 50% of $\frac{4EI}{L}$

$\frac{m}{M} = \frac{\theta K}{\theta \Sigma K}$ → individual moment

$\frac{K}{\Sigma K}$ → dist factor, DF

⇒ $m = \frac{K}{\Sigma K} M$ → distributed moment, DM

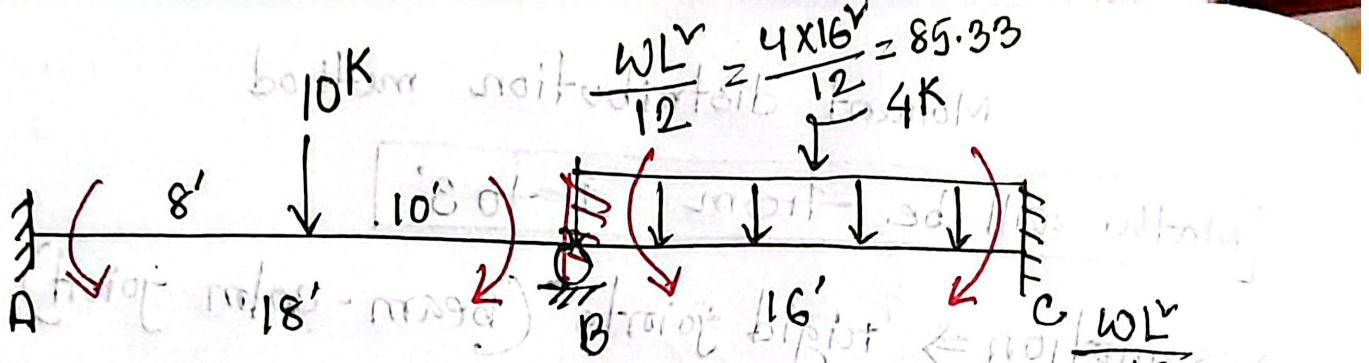
Intraconnecting joints → mid point where all ~~the are~~ joints are connected

Check ΣDF = 1 [OK]

Assumption, fixed support, DF = 0

Hinge " , DF = 1

CamScanner



$\frac{WL^2}{12} = \frac{4 \times 16^2}{12} = 85.33$

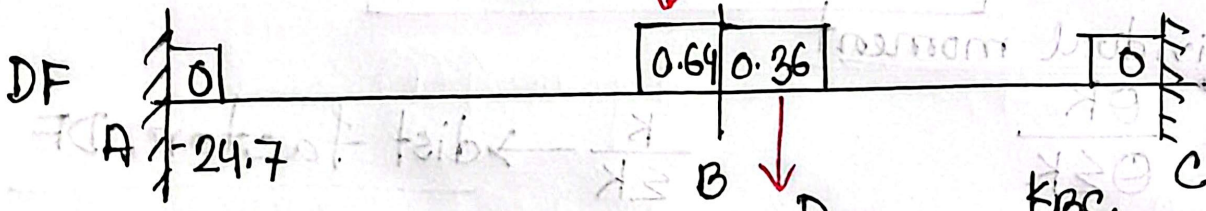
4K

$\frac{WL^2}{12} = 85.33$

$\frac{Pab^2}{L^2} = \frac{10 \times 8 \times 10^2}{18^2} = 24.7$

$\frac{Pa^2b}{L^2} = \frac{10 \times 8^2 \times 10}{18^2} = 19.75$

$\frac{K_{BA}}{K_{BA}+K_{BC}} = \frac{\frac{4.2EI}{18}}{\frac{4.2EI}{18} + \frac{4EI}{16}} = 0.64$



$D_{BC} = \frac{K_{BC}}{K_{BA}+K_{BC}} = \frac{\frac{4EI}{16}}{\frac{4.2EI}{18} + \frac{4EI}{16}} = 0.36$

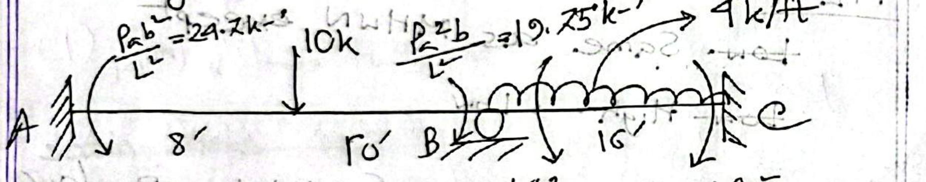
25·6·26 (Thursday) **DONE**

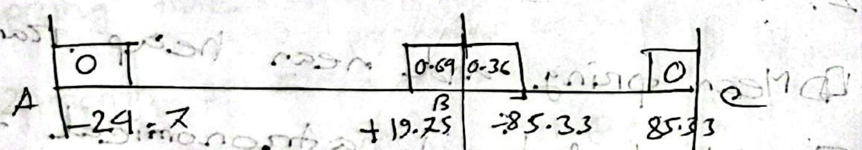
EWCE – 411 (Noor Sir)

Moment Distribution Method

Indeterminate structures

Assuming all the joints will be rigid





$$DF_{BA} = \frac{K_{BA}}{K_{BA} + K_{BC}} = \frac{\frac{4\,2EI}{18}}{\frac{42EI}{18} + \frac{4EI}{16}} = 0.64$$

· Larger section I ↑

$$DF_{BC} = \frac{K_{BC}}{K_{BA} + K_{BC}} = \frac{\frac{4EI}{16}}{\frac{4EI}{18} + \frac{4EI}{16}} = 0.36$$

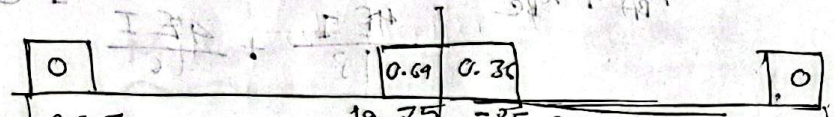
Governing moment = Releasing moment sign different [illegible]

Carryover at support → 50% of distributed moment (Same sign)

$\Sigma DF = 1$

Segment end moment → [illegible] positive [illegible] moment [illegible]

irina



-29.7 | 19.75 | -85.33 | +85.33

19.75 − 85.33 = −65.58 → Governing moment

+65.58 → Releasing moment

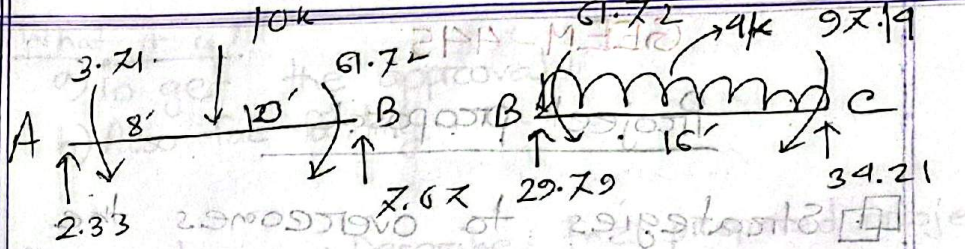
Distributed moment

Carryover moment

~~+20.9~~ 41.97/2 = 20.99	65.58 × 0.64 = 41.97	65.5x 0.36 = 23.61	23.61/2 = 11.81
−29.7 + 20.99 = −3.71	41.97 + 19.75 = 61.72	−85.33 + 23.61 = −61.72	85.33 + 11.81 = 97.14

Segment end moment

BMD → SFD ⇒ area



$+\circlearrowleft \Sigma M_A = 0$

$\Rightarrow 10 \times 8 + 61.72 - R_B \times 18 - 3.71 = 0$

$\Rightarrow R_B = 7.67$

$+\uparrow \Sigma F_y = 0$

$\Rightarrow R_A - 10 + 7.67 = 0 \Rightarrow R_A = 2.33$

$+\circlearrowleft \Sigma M_B = 0$

$\Rightarrow -61.72 + 4 \times 16 \times \frac{16}{2} + 97.14 - R_C \times 16 = 0$

$\Rightarrow R_C = 34.23$ 34.21

$+\uparrow \Sigma F_y = 0 \Rightarrow R_B - 4 \times 16 + 34.21 \Rightarrow R_B = 29.79$

9.7.26 (Thursday) **DONE**

EWCE – 411 (Noor sir)

* Deflection → আরো position এ আরো বড় moment দিতে হবে।

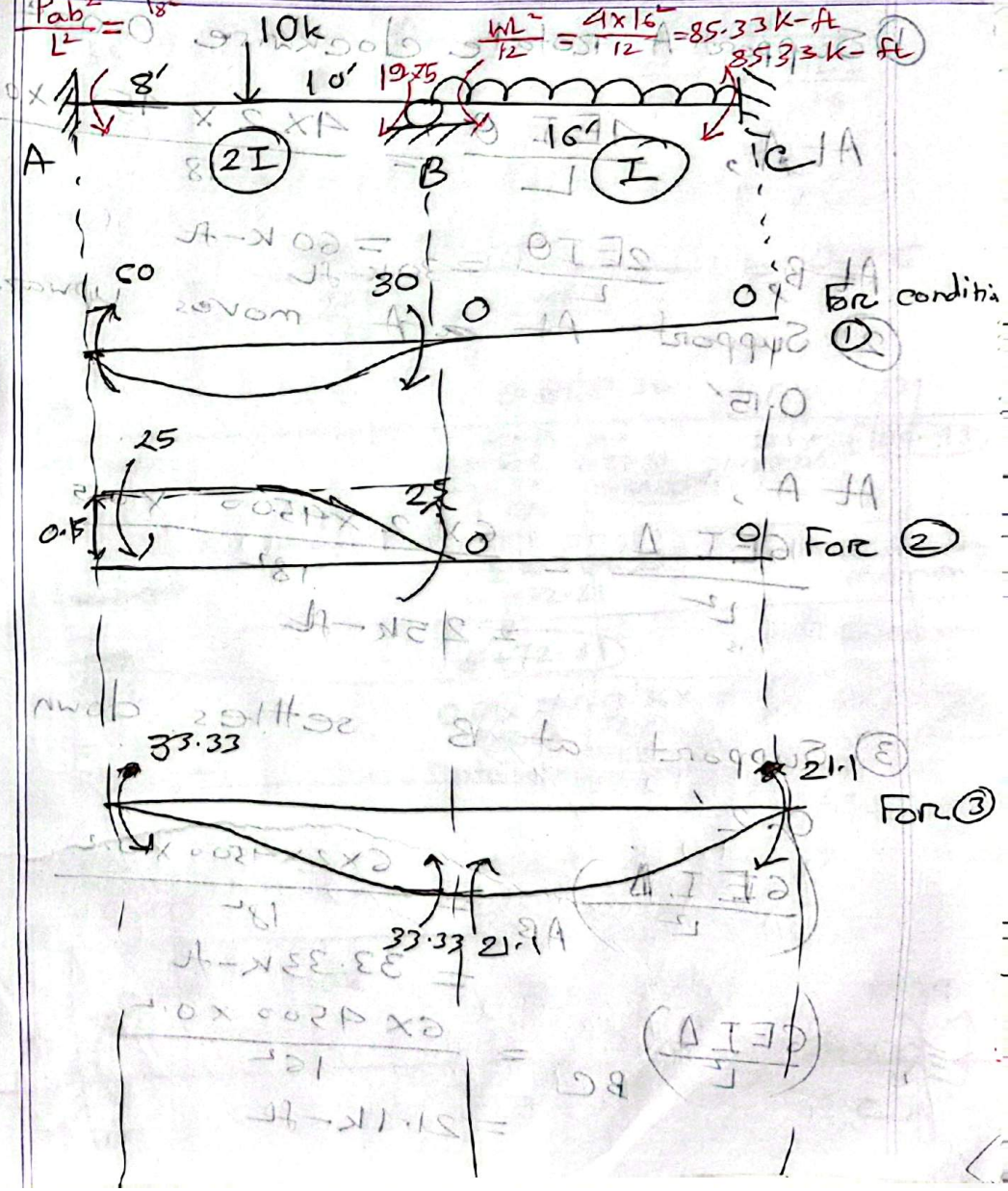
* Distribution factor → ~~factor~~
  Σ at fixed end = 0
  Σ " roller & pin = 1

* Governing moment & Releasing moment sign different

* Segmental end moment

$\frac{10\times8\times10^2}{18^2} = 24.7\ k\text{-ft}$

$\frac{Pab^2}{L^2} = 0$



① Support A rotate clockwise 0.03c

At A, $\frac{4EI\theta}{L} = \frac{4 \times 2 \times 4500 \times 0.03}{18}$

$= 60$ k-ft

At B, $\frac{2EI\theta}{L} = 30$ k-ft

② Support At A moves upward 0.15'

At A,

$\frac{6EI\Delta}{L^2} = \frac{6 \times 2 \times 4500 \times 0.15}{18^2}$

$= 25$ k-ft

③ Support at B settles down 0.2'

$\left(\frac{6EI\Delta}{L^2}\right)_{AB} = \frac{6 \times 2 \times 4500 \times 0.2}{18^2}$

$= 33.33$ k-ft

$\left(\frac{6EI\Delta}{L^2}\right)_{BC} = \frac{6 \times 4500 \times 0.2}{16^2}$

$= 211$ k-ft

+ve → clockwise

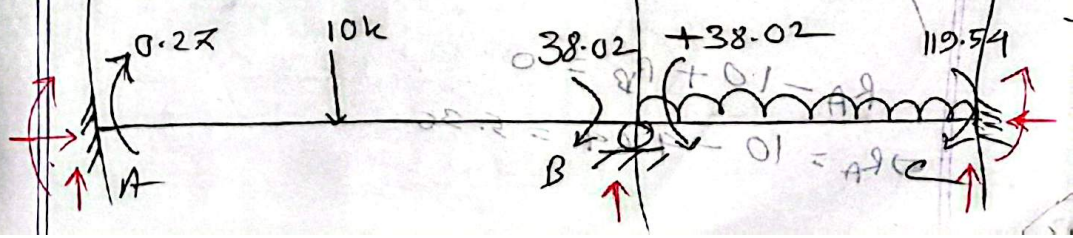
-ve → Anti "

$DF_{BA} = \frac{K_{BA}}{K_{BA} + K_{BC}} = \frac{42EI/18}{\frac{42EI}{18} + \frac{4EI}{16}}$

$= 0.64$

$DF_{BC} = \frac{4EI/16}{\frac{42EI}{18} + \frac{4EI}{16}} = 0.36$

	0	0.64	0.36	
		+19.25	21.1	21.1 + 85.33 = +106.43
	-24.7 + 60 - 25 - 33.33 = -23.03	+30 + 25 + 32.33 = -8.58	-85.33 = -64.23	
	~~-23.03~~	-8.58 + 64.23 = -72.81		Governing moment
	~~-23.03~~	+72.81		Releasing moment
	46.6/2 = 23.3 Carryover	0.64 × 72.81 = 46.6 Distributed	0.36 × 72.81 = 26.21 moment	26.21/2 = 13.105 Carryover
	23.3 - 23.03 = 0.27	46.6 - 8.58 = 38.02	26.21 - 64.23 = -38.02	13.105 + 106.43 = 119.54 Segment end moment



At A,

$\curvearrowleft + \Sigma M_A = 0$

~~$\Rightarrow 0.2x + 38.02 \times 18 - 38.02 \times 18$~~

$\Rightarrow 0.2x - R_B \times 18$

At AB,

$\curvearrowleft + \Sigma M_A = 0$

$\Rightarrow 0.2x - 18 \times R_B + 10 \times 8 = 0$

~~$\Rightarrow R_B = 0.015\,k$~~

$\Rightarrow R_B = 4.96\,k$

~~$R_A - 10 + R_B = 0$~~

$R_A - 10 + R_B = 0$

$\Rightarrow R_A = 10 - 4.64 = 5.36\,k$

$R_A - 10 + R_B = 0$

$\Rightarrow R_A = 10 - 4.64 = 5.36$

At BC,

$\curvearrowleft + \Sigma M_B = 0$

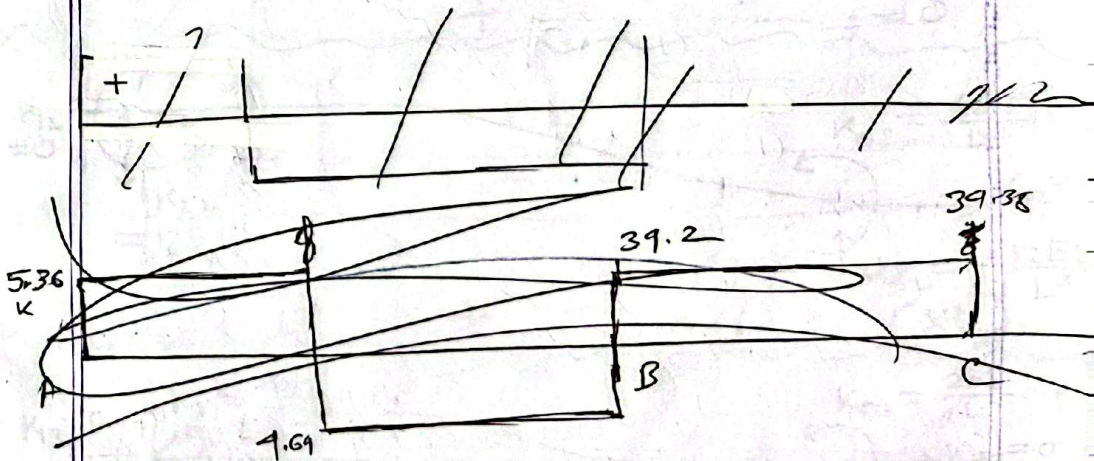
$\Rightarrow -38.02 + \frac{4 \times 16}{2} \times 16 - R_C \times 16 = 0$

$\Rightarrow R_C = 29.62\,k$

$\uparrow + \Sigma F_y = 0$

$\Rightarrow R_B - 4 \times 16 + R_C = 0$

$\Rightarrow R_B = 34.38\,k$

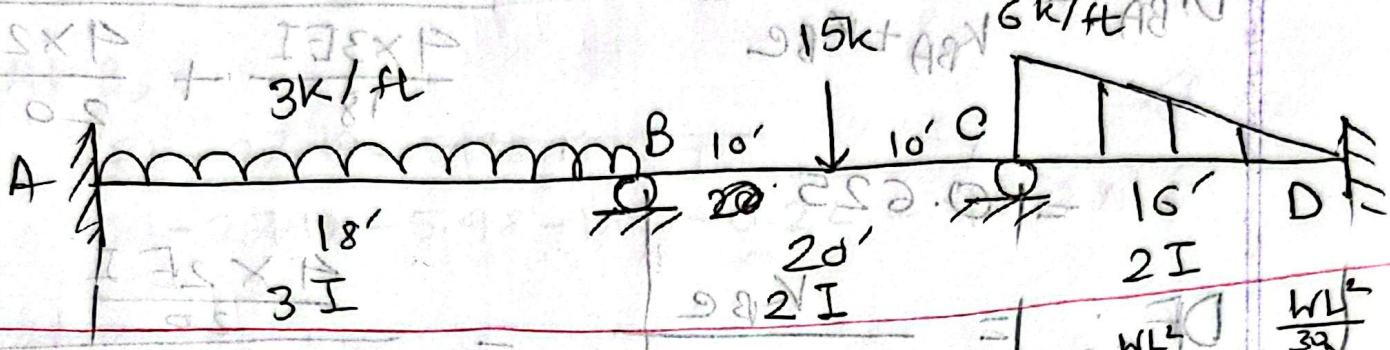


16.7.26 (Thursday) DONE

EWCE-411 (Noor Sir)

DF → For all inter-connected members

Problem 3,



	A	B	C	D
FEM	$\frac{WL}{12}$ = (-81)	+81	$\frac{PL}{8} = \frac{15\times10}{8}$ = (-37.5)	37.5 = $\frac{WL^2}{20}$ = (-76.8)	$\frac{WL^2}{30}$ = 51.2
DF	0	(0.625)	(0.375)	(0.444)	(0.556)	0
Governing moment		81 − 37.5 = 43.5		37.5 − 76.8 = −39.3	
Release moment		−43.5		+39.3	
Distributing	$\frac{1}{2}\times(-27.19)$ = (-13.59)	−43.5 ×0.625 = (-27.19)	−43.5 ×0.375 = (-16.31)	17.45	21.85	10.925
Carryover		$\frac{17.45}{2}$ = 8.72	$\frac{-16.31}{2}$ = −8.15		
		−8.72	+8.15		
	(-2.74)	(-5.48)	(-3.29)	(+3.62)	(+4.35)	2.26
		$\frac{3.62}{2}$ = 1.81	$\frac{-3.29}{2}$ = −1.64		
		−1.81			
	(-0.56)	(-1.13)	(-0.68)	(+0.91)	(+0.45)
		$\frac{-1.13}{2}$ = −0.56	$\frac{-0.68}{2}$ = −0.34		
		+0.36	+0.34		
		(-0.22)	(-0.14)	(+0.19)	(+0.09)	
	(-97.89)	(+46.98)	(+46.98)	(+49.41) (+49.34)	(-49.32)	(+64.83)

DONE $K = \frac{4EI}{L}$

Distribution factor

$$DF_{BA} = \frac{K_{BA}}{K_{BA}+K_{BC}} = \frac{\frac{4\times 3EI}{18}}{\frac{4\times 3EI}{18}+\frac{4\times 2EI}{20}}$$

$= 0.625$

$$DF_{BC} = \frac{K_{BC}}{K_{BC}+K_{BA}} = \frac{\frac{4\times 2EI}{20}}{\frac{4\times 3EI}{18}+\frac{4\times 2EI}{20}}$$

$= 0.375$

$$DF_{CB} = \frac{K_{CB}}{K_{CB}+K_{CD}} = \frac{\frac{4\times 2EI}{20}}{\frac{4\times 2EI}{20}+\frac{4\times 2EI}{16}}$$

$= 0.444$

$$DF_{CD} = \frac{K_{CD}}{K_{CB}+K_{CD}} = \frac{\frac{4\times 2EI}{16}}{\frac{4\times 2EI}{20}+\frac{4\times 2EI}{16}}$$

$= 0.556$

* Distributing moment fraction এর যোগফল 1 হবে।
* Exchange moment joint এ count হবে

DONE

At A,

$-81 - 13.50 - 2.74 - 0.56 = -97.89$

At B,

$81 - 27.19 - 5.98 - 1.13 - 0.27 = 46.98$

At B,

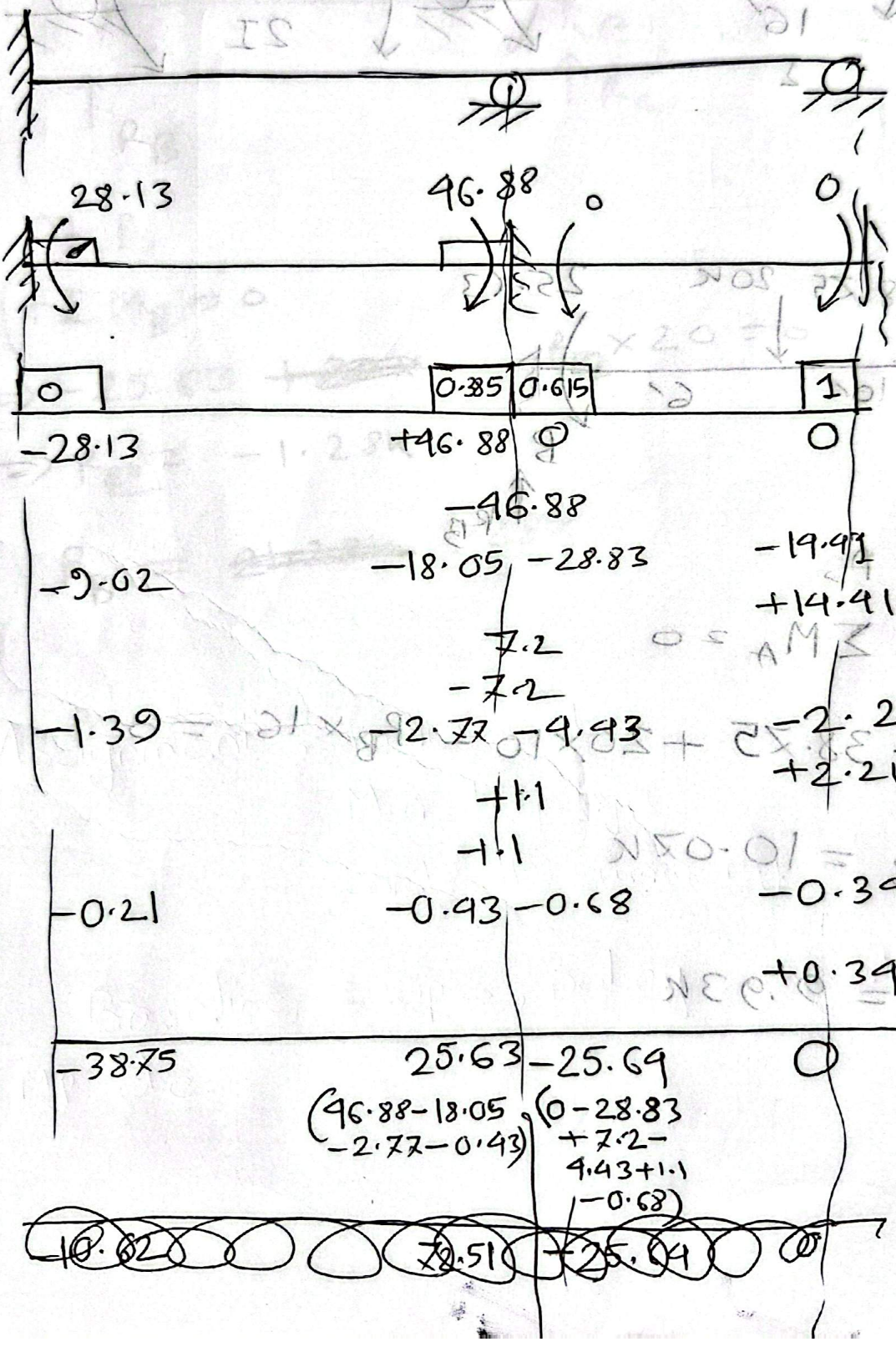
$-37.5 - 16.31 + 8.22 - 3.29 + 1.81 = 0.68 + 0.36 - 0.14 = -46.98$

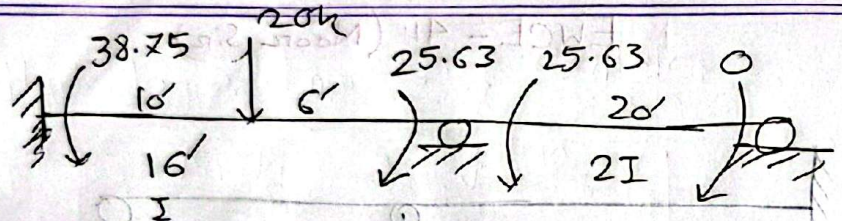
At C,

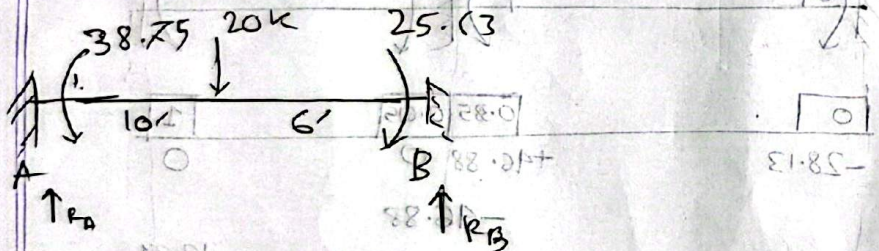
$37.5 + 17.95 - 8.15 + 3.62 - 1.64 + 0.37 + 0.34 + 0.15 = 49.32$

13·8·26 (Thursday)

EWCE - 411 (Noor Sir)







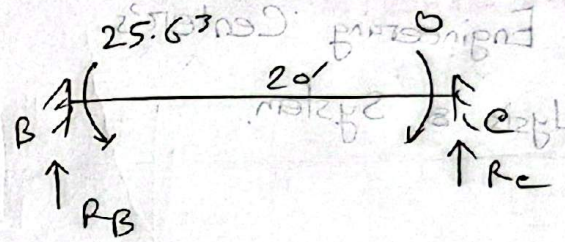
At A,

$$\curvearrowleft + \Sigma M_A = 0$$

$$\Rightarrow -38.75 + 20 \times 10 - R_B \times 16 = 0$$

$$\Rightarrow R_B = 10.07k$$

$$R_A = 9.93k$$



At B,

$$\curvearrowleft + \Sigma M_B = 0$$

$$\Rightarrow -25.63 - R_C \times 20 = 0$$

$$\Rightarrow R_C = -1.28k$$

$$R_B = 1.28k$$

27.8.26 (Thursday)

EWCE – 411 (Noor Sir)

Modified stiffness:

Support condition

$$K = \frac{3EI}{L}$$

Pin / Hinge / Roller

Modified ও carry over লাগবে না

Ques ও না বলে নিজে modified না

3.9.26 (Thursday)
EWCE-411 (Noor Sir)

$\chi = 45$

