F → Plex T → theory N → not mention.
M → mom
S →

16-17

1 (a) → theory
(b) → Flexi

2 (a) → T
(b) → F/N

3 (a) → F/N
(b) → F

4 (a) → S
5 (a) → M
(b) → M
6 (a) → M
(b) → M
7 (a) → M
(b) → S
8 (a) → S
(b) → S

S → 4
F → 4
M → 5

15-16

1 (a) → M
(b) → M
2 (a) S
(b) S
3 (a) S
(b) M
4 (a) M
(b) S
5 (a) F
(b) F
6 (a) F
(b) F
7 (a) F
(b) S
8 (a) N
(b) S

S → 5
F → 5
M → 4

13-14

14-15

1 (a) F
(b) F
2 (a) F
(b) F
3 (a) S
(b) S
4 (a) S
(b) → T
5 (a) T
(b) M
6 (a) M
(b) M
7 (a) S
(b) F
8 (a) S
(b) S

S → 6
F → 5
M → 3

13-14

1 (a) M
2 → F
3 → M
4 → F
5 → M
6 → F
7 → M
8 → S
9 → S
10 → S
11 → S
12 → S
13 → S
14 → F

S → 6
F → 4
M → 4

12-13

1 (a) M
(b)
2 (a) M
(b) S
3 (a) S
(b) S
4 (a) S
5 (a) F
(b) F/T
6 (a) F
(b) F
7 (a) F
(b) F
8 F.

S → 4
F → 6
M → 2

11-12

1 (a) F
(b) S
2 (a) F
(b) S
3 (a) N
(b) S
4 → S
5 (a) M
(b) F
6 (a) Scope
(b) M
7 (a) M
8 (a) Scope
(b) —

S → 4
F → 3
M → 3

13-14

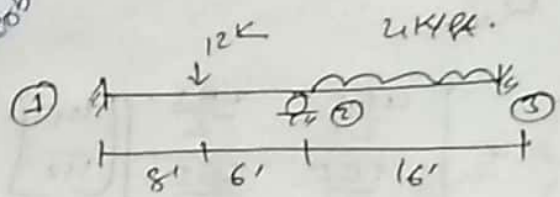
11 12
10 11
8 9

Nothing is certain.

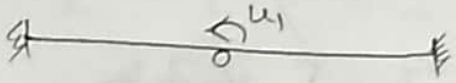
16-17

8 ⑥

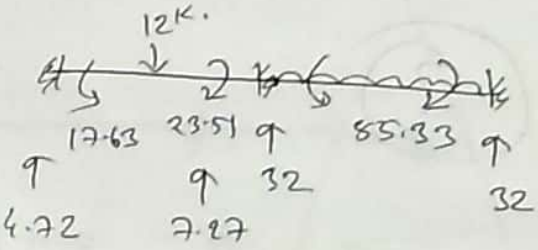
Beam problem



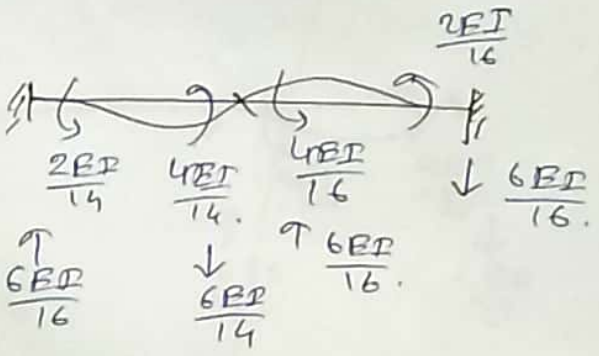
DOF = 1



$u_1 = 0$



$u_1 = 1$



$P_m = P_j + K_{mj}$

$$0 = (85.33 - 23.51) + 1\left(\frac{4EI}{16} + \frac{4EI}{14}\right)u_1$$ 61.82

$$\Rightarrow u_1 = -61.82 \times \frac{28}{15EI} = -115.39/EI$$

at ①

$M_1 = 17.63 + \frac{2EI}{14} \times u_1$

$= 17.63 + \frac{2EI}{14} \times -\frac{115.39}{EI} = 1.145$ K-ft.

$V = 4.72 + \frac{6EI}{16} u_1$

$= -38.55$

at 2

$M = (85.33 - 23.51) + \left(\frac{4EI}{16} + \frac{4EI}{14}\right) u_1$

$= 0$

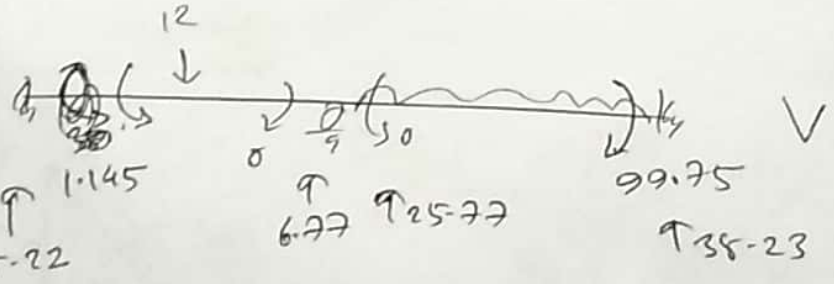
$V = 32 + 7.27 \times \left(\frac{6EI}{16} - \frac{6EI}{14}\right) u_1$

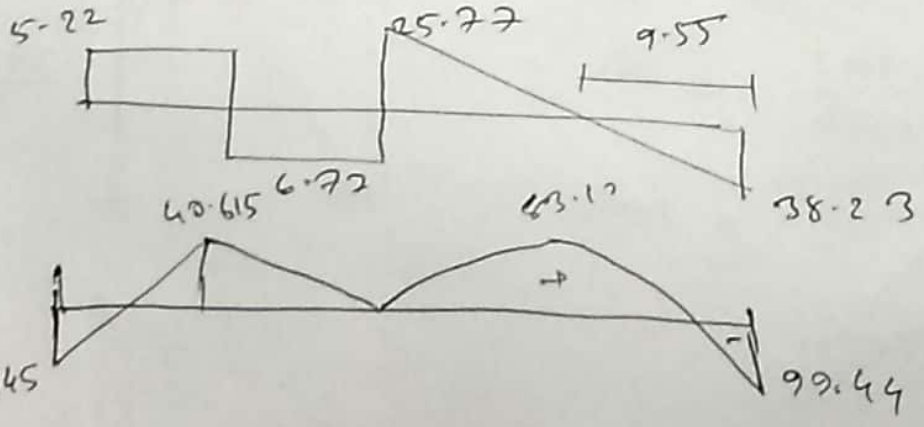
$= 45.45$

at 3

$M = -85.33 + \frac{2EI}{16} u_1 = -99.75$

$V = -\frac{6EI}{16} + 32 = 75.27$



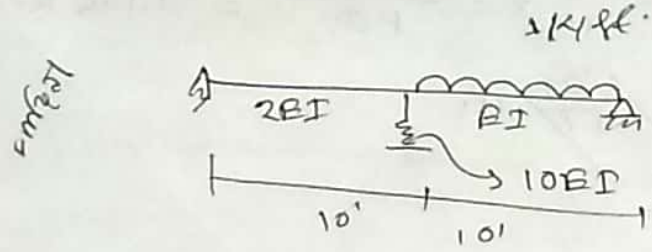


$\frac{38.23}{x} = \frac{25.77}{16-x}$

15-16 none

14-15

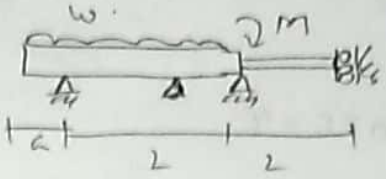
7 (5)



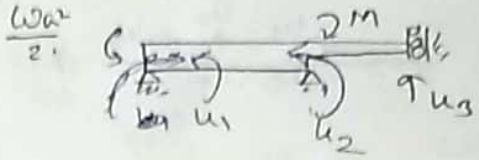
Beam problem

2013-14

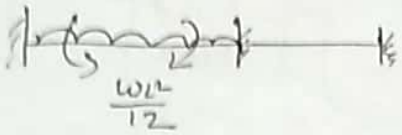
4.



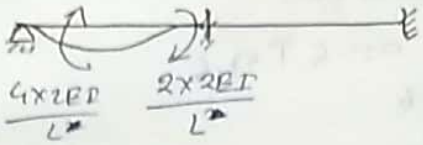
DOKI = 3.



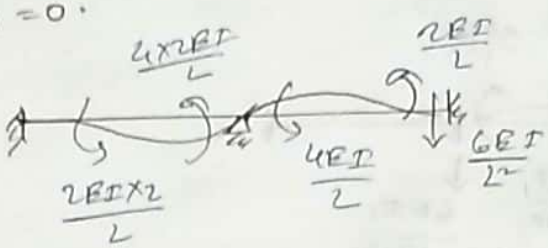
$u_1 = u_2 = u_3 = 0$



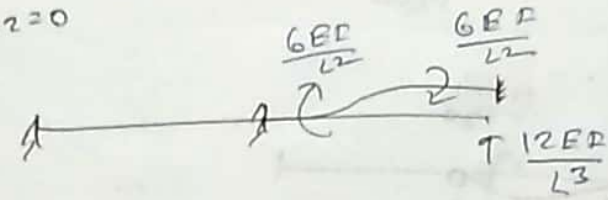
$u_1 = 1 \quad u_2 = u_3 = 0$



$u_2 = 1 \quad u_1 = u_3 = 0.$



$u_3 = 1 \quad u_1 = u_2 = 0$

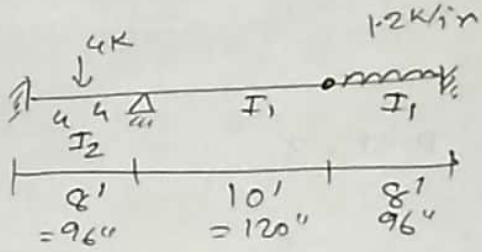


$$P_m + K u = P_j$$

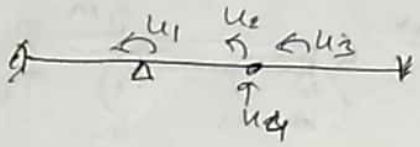
$$\Rightarrow \begin{Bmatrix} +\frac{wa^2}{2} \\ -M \\ 0 \end{Bmatrix} = \begin{Bmatrix} +\frac{wL^2}{12} \\ -\frac{wL^2}{12} \\ 0 \end{Bmatrix} + \begin{bmatrix} -\frac{6EI}{L} & +\frac{4EI}{L} & 0 \\ -\frac{4EI}{L} & \frac{12EI}{L} & -\frac{6EI}{L^2} \\ 0 & -\frac{6EI}{L^2} & \frac{12EI}{L^3} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

2012-13

3(a)

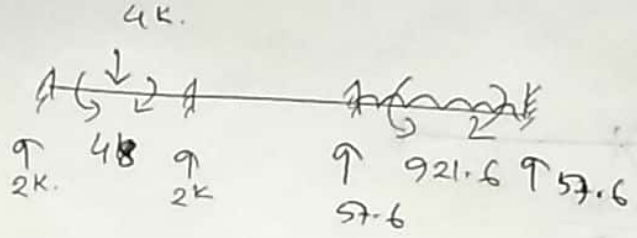


DOKI = 4

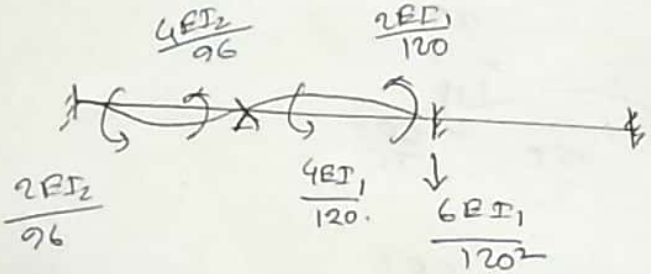


$E = 3000\ k/in^2$
$I_1 = 10000\ in^4$
$I_2 = 7500\ in^4$

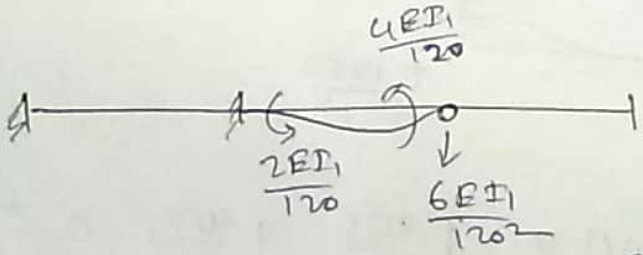
$u_1 = u_2 = u_3 = u_4 = 0$.



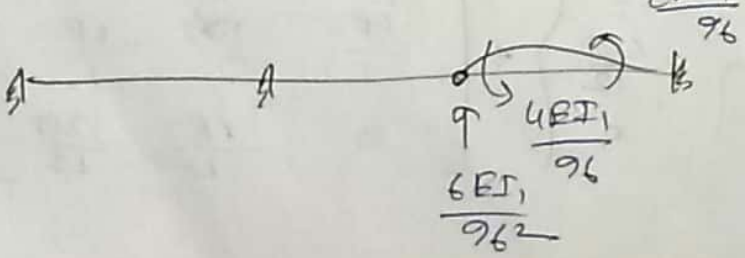
$u_1 = 1$



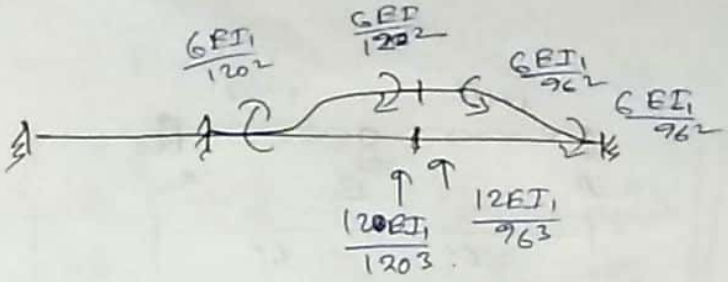
$u_2 = 1$



$u_3 = 1$



$u_4 = 1$

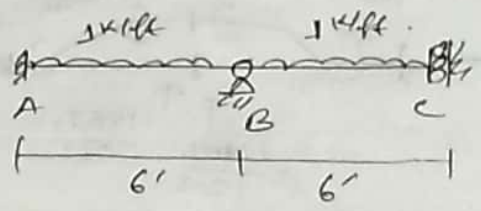


$$\therefore P_j^0 = P_m + K u$$

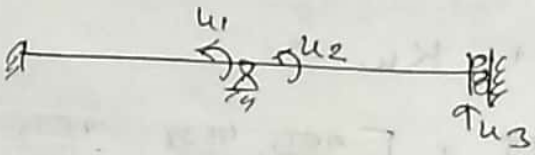
$$\Rightarrow \begin{Bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{Bmatrix} = \begin{Bmatrix} -48 \\ 0 \\ 921.6 \\ 57.6 \end{Bmatrix} + \begin{bmatrix} \frac{4EI_1}{96} + \frac{4EI_1}{120} & \frac{2EI_1}{120} & 0 & -\frac{6EI_1}{120^2} \\ \frac{2EI_1}{120} & \frac{4EI_1}{120} & 0 & -\frac{6EI}{120^2} \\ 0 & 0 & \frac{4EI_1}{96} & \frac{6EI_1}{96^2} \\ -\frac{6EI_1}{120^2} & -\frac{6EI_1}{120^2} & \frac{6EI_1}{96^2} & \frac{12EI_1}{120^3} + \frac{12EI_1}{96^3} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \end{bmatrix}$$

11-12

3 (a)

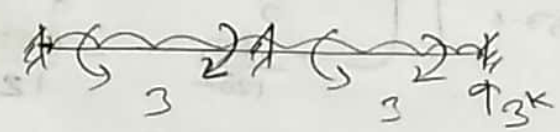


DOF = 3



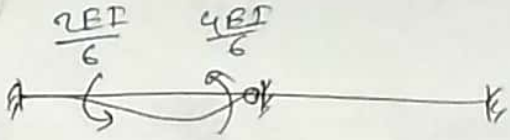
$u_1 = u_2 = u_3 = 0$

P_m



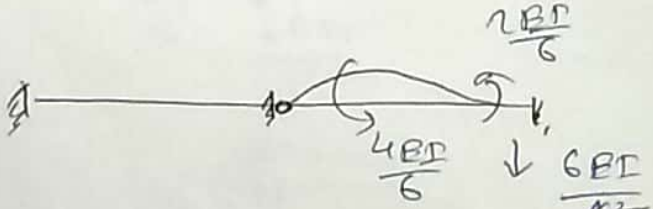
$P_{m1} = -3$ k-ft, $P_{m2} = +3$ k-ft, $P_{m3} = 3$ k

$u_1 = 1$



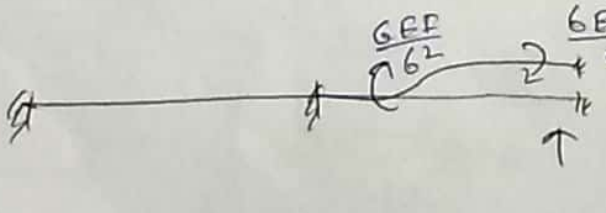
$K_{11} = \frac{4EI}{6}$ $K_{21} = 0$ $K_{31} = 0$.

$u_2 = 1$



$K_{12} = 0$ $K_{22} = \frac{4EI}{6}$ $K_{32} = -\frac{6EI}{6^2}$

$u_3 = 1$



$K_{13} = 0$ $K_{23} = -\frac{6EI}{6^2}$ $K_{33} = \frac{12EI}{6^3}$

$$P_f = P_m + K u.$$

$$\begin{Bmatrix} 0 \\ 0 \\ 0 \end{Bmatrix} = \begin{Bmatrix} -3 \\ 3 \\ 3 \end{Bmatrix} + \begin{bmatrix} \frac{4EI}{6} & 0 & 0 \\ 0 & \frac{4EI}{6} & -\frac{6EI}{6^2} \\ 0 & -\frac{6EI}{6^2} & \frac{12EI}{6^3} \end{bmatrix} \begin{bmatrix} u_1 \\ u_2 \\ u_3 \end{bmatrix}$$

$$u_1 = \frac{4.5}{EI}$$

$$u_2 = \frac{72}{EI}$$

$$u_3 = -\frac{270}{EI}.$$

Moment at c

$$M_c = -3 + 0 \times u_1 + \frac{2EI}{6} \times u_2 - \frac{6EI}{6^2} u_3.$$

$$= -3 + 0 \times \frac{4.5}{EI} + \frac{2EI}{6} \times \frac{72}{EI} - \frac{6EI}{6^2} \times \left(-\frac{270}{EI}\right)$$

$$= -3 + 0 + 24 + 45 = 66 \text{ k-ft } (\curvearrowleft)$$