Example 7-1

Determine the effective length factor for each of the columns of the frame shown in Fig. 7.4 if the frame is not braced against sidesway. Use the alignment charts of Fig. 7.2(b).

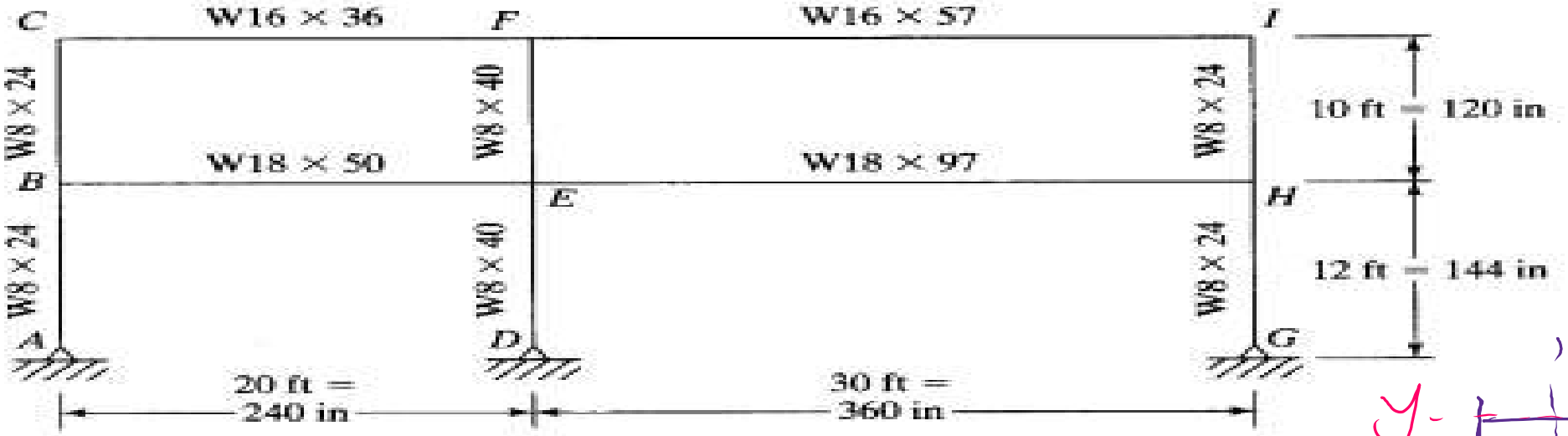

FIGURE 7.4

all Columns

HT

Column	Steel section	Ix	L-inch	I/L value
AB	W8x24	82.7	144	0.574
BC	W8x24	82.7	120	0.689
DE	W8x40	146	144	1.014
EF	W8x40	146	120	1.217
GH	W8x24	82.7	144	0.574
HI	W8x24	82.7	120	0.689

Prepared by Eng.Maged Kamel.

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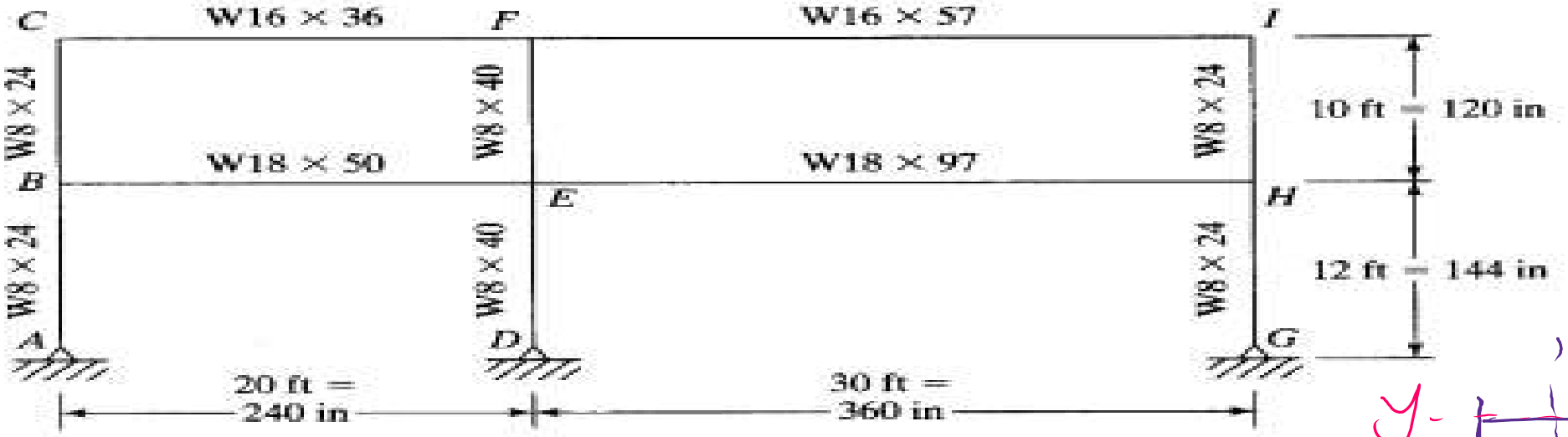

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Determine the effective length factor for each of the columns of the frame shown in Fig. 7.4 if the frame is not braced against sidesway. Use the alignment charts of Fig. 7.2(b).

Unbraced Frame
JACK McCORMAC

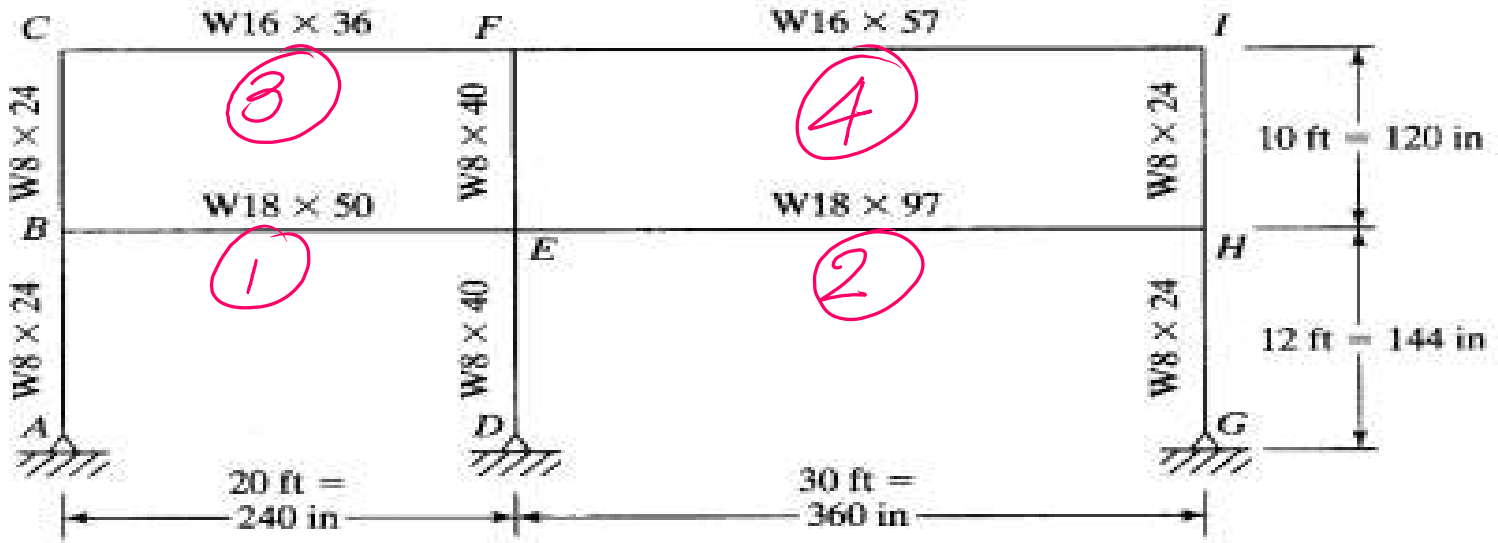

FIGURE 7.4

4 Girders (beams)

	Girders	Steel section	Ix	L-inch	I/L value
1-	BE	W18x50	800	240	3.333
2-	EH	W18x97	1750	360	4.861
3-	CF	W16x36	448	240	1.867
4-	FI	W16x57	758	360	2.106

Example 7-1

Determine the effective length factor for each of the columns of the frame shown in Fig. 7.4 if the frame is not braced against sidesway. Use the alignment charts of Fig. 7.2(b).

Unbraced Frame

JACK MCCORMAC

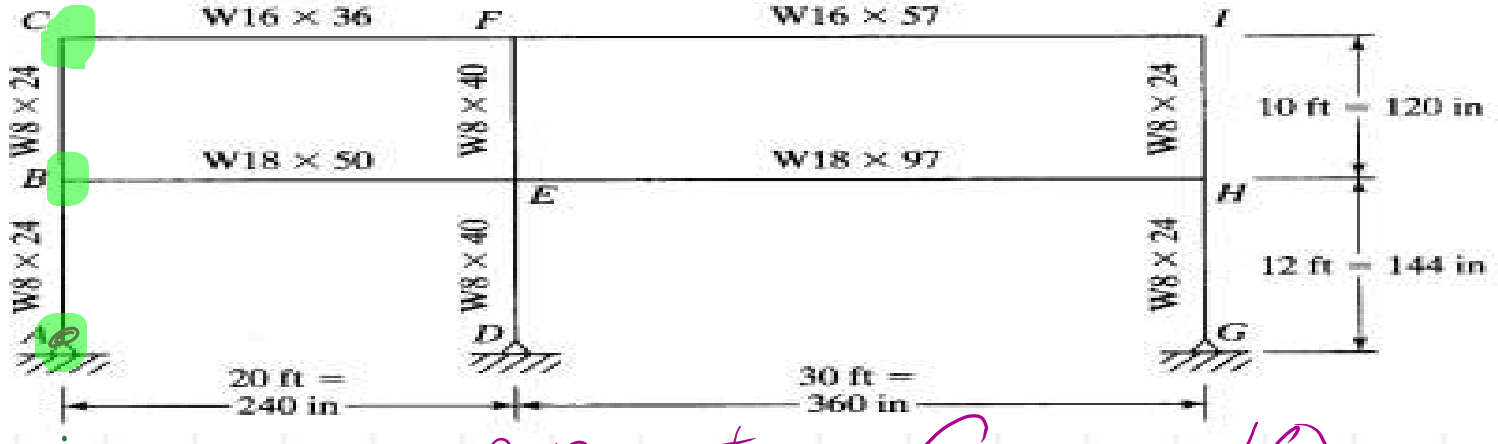

FIGURE 7.4

A is a pin support $G_A = 10$

$$G \text{ at joint } B \quad (BA) = \frac{E\left(\frac{I}{L}\right)_{BC} + \left(\frac{I}{L}\right)_{BA}}{E\left(\frac{I}{L}\right)_{BE}} = \frac{(0.689) + (0.574)}{3.333}$$

$$G_B = 0.379$$

$$G \text{ at joint } C \quad (CB) = \frac{\Sigma E\frac{I}{L}\text{ Col}}{\Sigma E\frac{I}{L}\text{ beams}} = \frac{0.689}{1.267} = 0.369$$

Example 7-1

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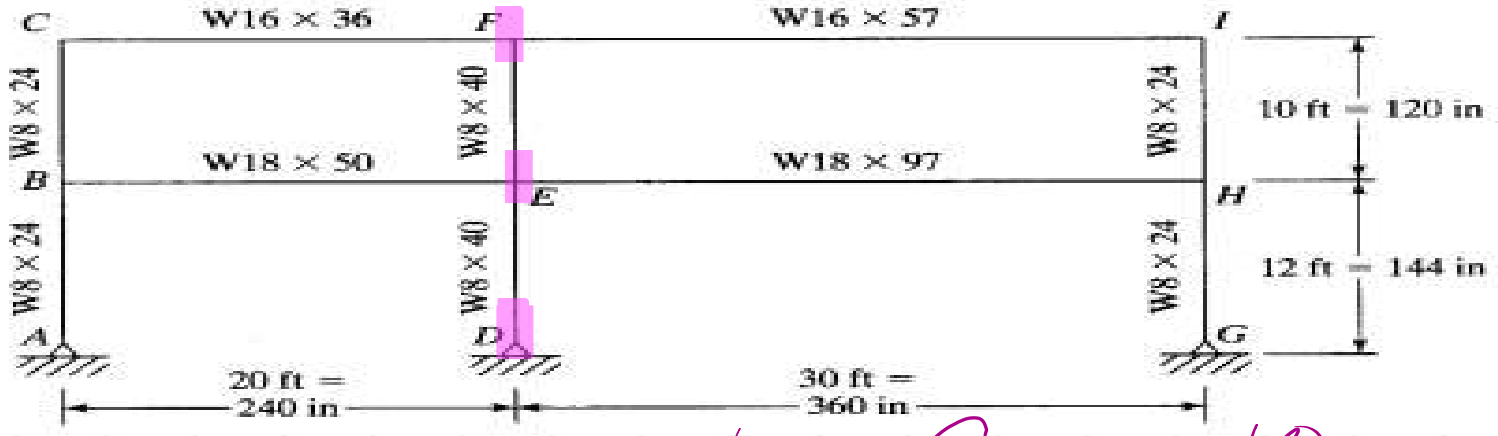


FIGURE 7.4

Unbraced Frame

JACK MCCORMAC

D is a pin support $G_D = 10$

$$G \text{ at joint } F \left(\frac{CL}{FE}\right) = \frac{(1.217)}{(1.867 + 2.106)} = 0.306$$

$$G \text{ at joint } E \left(\frac{CL}{EF}\right) = \frac{(1.014 + 1.217)}{(3.333 + 4.861)} = 0.2723$$

Example 7-1

Determine the effective length factor for each of the columns of the frame shown in Fig. 7.4 if the frame is not braced against sidesway. Use the alignment charts of Fig. 7.2(b).

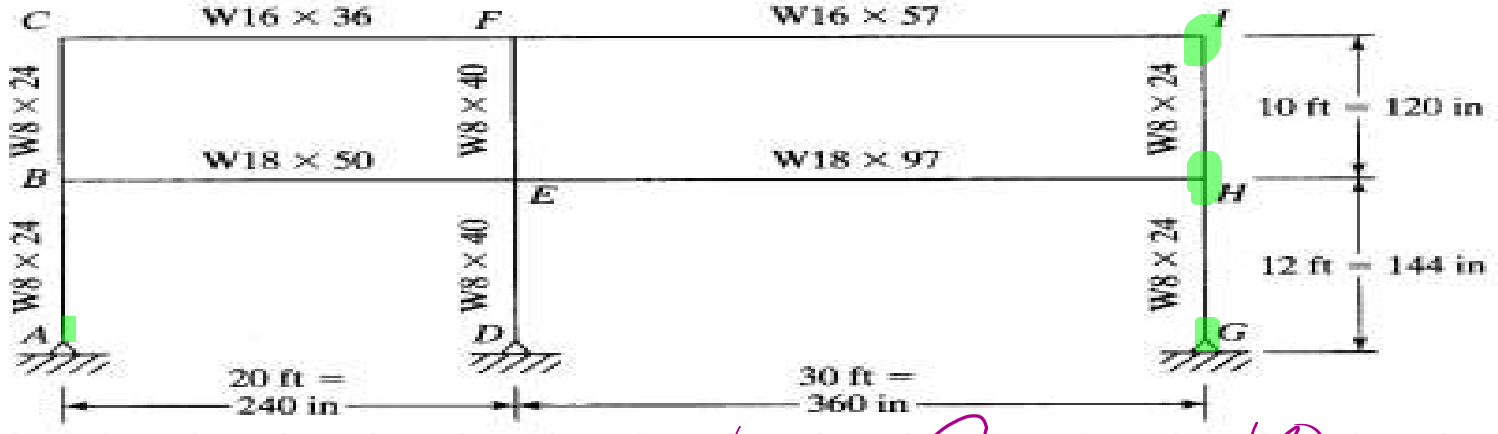


FIGURE 7.4

Unbraced Frame

JACK MCCORMAC

G is a pin support $G_G = 10$

CL

G at joint I $(I_H) = (0.689)/(2.106) = 0.327$

G at joint H $(I_H + I_G) = \dfrac{(0.574 + 0.689)}{(4.861)} = 0.259$

G Joint Values

Unbraced Frame

JACK MCCORMAC

Example 7-1

Determine the effective length factor for each of the columns of the frame shown in Fig. 7.4 if the frame is not braced against sidesway. Use the alignment charts of Fig. 7.2(b).

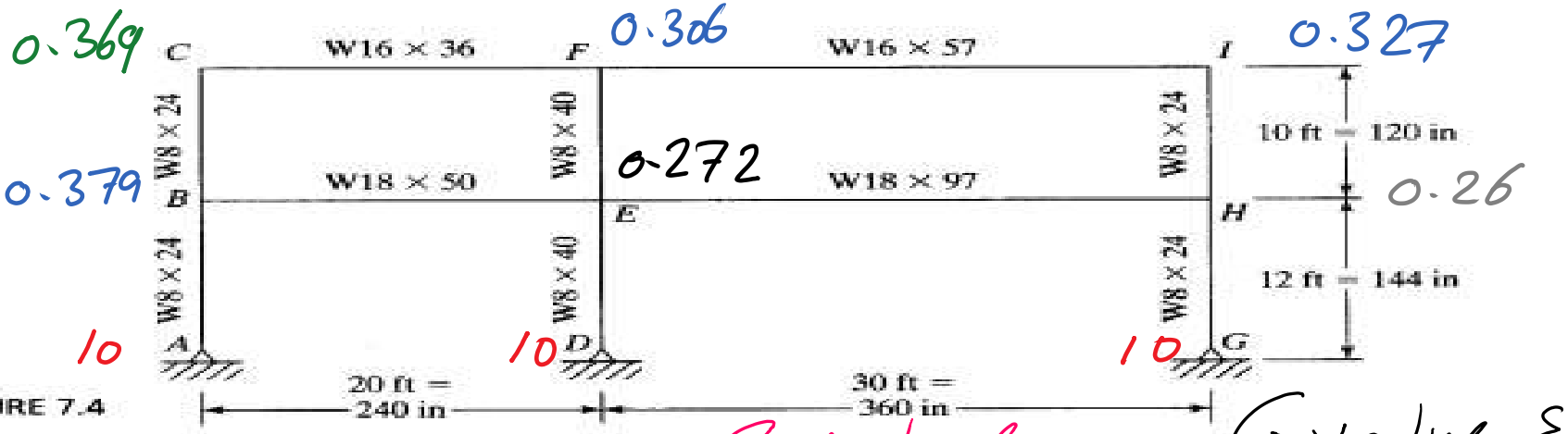


FIGURE 7.4

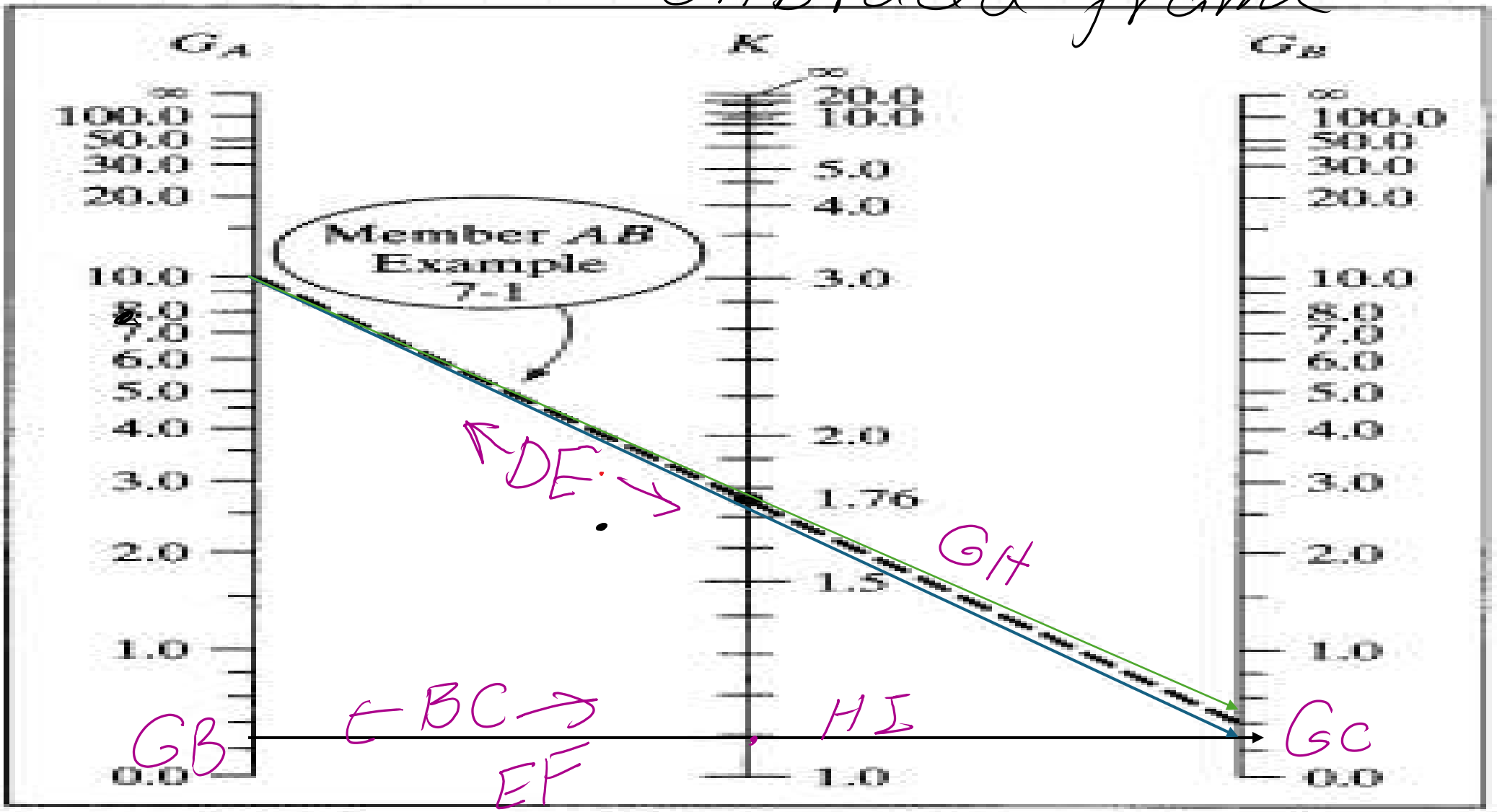
Solution

G_A : one end

G_B : other end

Col	G value	G value End	K
AB	$G_A = 10$	$G_B = 0.379$	: 1.76
BC	$G_B = 0.379$	$G_C = 0.369$	: 1.12
DE	$G_D = 10$	$G_E : 0.272$	: 1.74
EF	$G_E = 0.272$	$G_F : 0.306$	: 1.10
GH	$G_G = 10$	$G_A : 0.26$	1.73
HI	$G_H = 0.26$	$G_I : 0.327$	1.10

Unbraced frame



(b) Sidesway uninhibited (Moment Frame)

Uninhibited