

ج) $G = \frac{P^2}{2B} \cdot \frac{dc}{da}$

برای قیمت استهای تیر به طول (L-a) داریم:

$\Delta_1 = \frac{P(L-a)}{A_1 E}$; $A_1 = hB$

$\Rightarrow \Delta_1 = \frac{P(L-a)}{hBE}$

$\Rightarrow C_1 = \frac{\Delta_1}{P} = \frac{(L-a)}{hBE}$

$\Rightarrow \frac{dc_1}{da} = \frac{-1}{hBE} \Rightarrow G_1 = \frac{P^2}{2B} \cdot \frac{-1}{hBE} = \frac{-P^2}{2B^2 hE}$

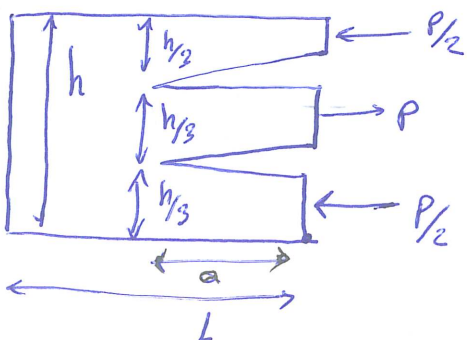
برای قیمت تیر با به طول (a) داریم: G_2

$\Delta_2 = \frac{Pa}{A_2 E}$; $A_2 = \frac{Bh}{3}$

$C_2 = \frac{\Delta_2}{P} = \frac{3a}{BhE} \Rightarrow \frac{dc_2}{da} = \frac{3}{BhE} \Rightarrow G_2 = \frac{P^2}{2B} \cdot \frac{3}{BhE} = \frac{3P^2}{2B^2 hE}$

$\Rightarrow G = G_1 + G_2 = \frac{-P}{2B^2 hE} + \frac{3P^2}{2B^2 hE} = \frac{2P^2}{2B^2 hE} \Rightarrow G = \frac{P^2}{B^2 hE}$

ب)



ج)

برای تیر که تحت کشش با نیروی P قرار دارد داریم:

$\Delta_1 = \frac{Pa}{A_1 E}$; $A_1 = \frac{h}{3} B$

$\Rightarrow \Delta_1 = \frac{3Pa}{hBE} \Rightarrow C = \frac{3a}{hBE} \Rightarrow \frac{dc}{da} = \frac{3}{hBE} \Rightarrow G_1 = \frac{P^2}{2B} \cdot \frac{3}{hBE}$

$\Rightarrow G_1 = \frac{3P^2}{2B^2 hE}$

ارام صفر بعد:

برای سیرهای مدحت فشار در تیر طول a :

$$\Rightarrow \Delta_2 = \frac{3Pa}{2hEB}$$

$$\Rightarrow c = \frac{\Delta}{P} = \frac{3a}{2hBE} \Rightarrow \frac{dc}{da} = \frac{3}{2hBE}$$

$$\Rightarrow G_2 = \frac{P^2}{2B} \cdot \frac{dc}{da} = \frac{P^2}{2B} \cdot \frac{3}{2hBE} = \frac{3P^2}{4B^2Eh}$$

$$\Rightarrow G = 2G_2 + G_1 = \frac{3P^2}{2B^2Eh} + \frac{3P^2}{2B^2Eh} = \frac{6P^2}{B^2Eh}$$

برای حالتی که نیرو ثابت باشد : $P = cte$

$$A = ha$$

$$F = P\Delta ; U = \frac{P\Delta}{2} \Rightarrow \Pi = U - F = -\frac{P\Delta}{2} = -U$$

$$G = -\frac{d\Pi}{dA} = \frac{1}{B} \cdot \left(\frac{dU}{da}\right) P \quad \Rightarrow \quad G = \frac{P}{2B} \cdot \left(\frac{d\Delta}{da}\right) P$$

$$\frac{dU}{da} = \frac{dU}{d\Delta} \cdot \frac{d\Delta}{da} = \frac{P}{2} \cdot \frac{d\Delta}{da}$$

$$\Rightarrow \frac{d\Delta}{da} = \frac{d\Delta}{dc} \cdot \frac{dc}{da} \Rightarrow G = \frac{\Delta}{P} \Rightarrow \Delta = cP \Rightarrow \frac{d\Delta}{da} = P \frac{dc}{da}$$

$$\Rightarrow G = \frac{P^2}{2B} \cdot \left(\frac{dc}{da}\right) P$$

برای حالتی که $c = cte$: $F = 0 ; U = \frac{P\Delta}{2} \Rightarrow G = -\frac{d\Pi}{dA} = -\frac{1}{B} \left(\frac{dU}{da}\right) \Delta$

$$\Rightarrow \frac{dU}{da} = \frac{dU}{dP} \cdot \frac{dP}{da} \Rightarrow \frac{dU}{da} = \frac{\Delta}{2} \cdot \frac{dP}{da}$$

$$\Rightarrow G = -\frac{\Delta}{2B} \left(\frac{dP}{da}\right) \Delta$$

$$\Rightarrow G = \frac{\Delta^2}{2Bc^2} \cdot \left(\frac{dc}{da}\right) \Delta \quad \text{و} \quad \frac{\Delta}{c} = P$$

$$\frac{dP}{da} = \frac{dP}{dc} \cdot \frac{dc}{da} \Rightarrow P = \frac{\Delta}{c} \Rightarrow \frac{dP}{dc} = -\frac{\Delta}{c^2}$$

$$\Rightarrow G = \frac{P^2}{2B} \cdot \left(\frac{dc}{da}\right) \Delta$$