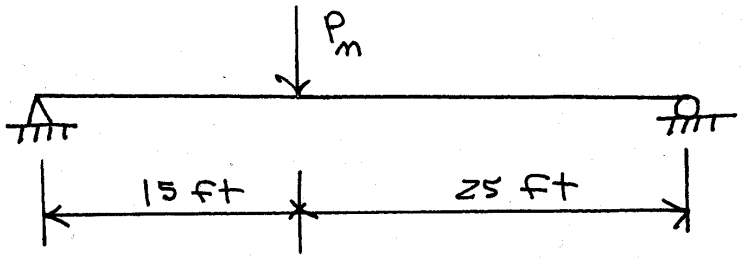
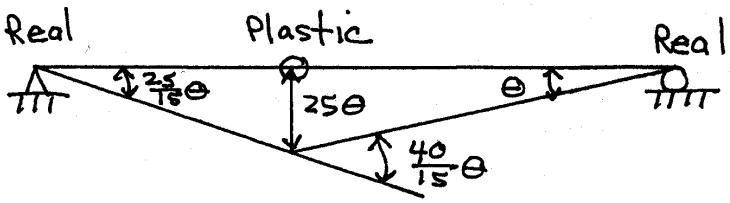
ENCE 355 – Introduction to Structural Design
SOLUTIONS to Homework Set No. 14
Fall 2002

PROB# 8-22

Using a W18X143 ($Z_x = 322\ in.^3$)

$$M_n = F_y Z = \frac{(50)(322)}{12} = 1341.7\ ft\text{-}k$$





$$M_n\left(\frac{40}{15}\theta\right) = (P_n)(25\theta)$$

$$P_n = 0.10667\, M_n$$

$$P_n = (0.10667)(1341.7)$$

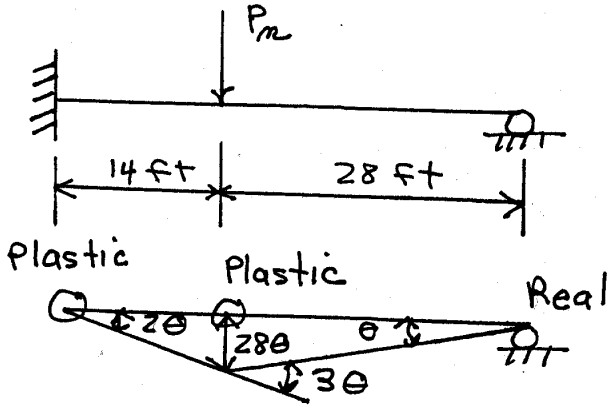
$$\boxed{P_n = 143.1\ k}$$

✓ gCMC

PROB #8-28

Using a W30 x 124 ($Z_x = 408\ in.^3$)

$$M_n = F_y Z_x = \frac{(50)(408)}{12} = 1700\ ft\text{-}k$$



$$M_n(5\theta) = (P_n)(2\theta)$$

$$P_n = \left(\frac{5}{2\theta}\right)(M_n) = \left(\frac{5}{2\theta}\right)(1700)$$

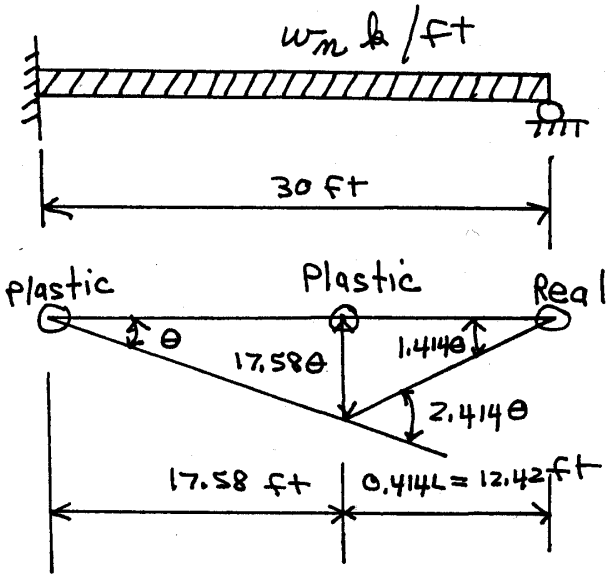
$$\boxed{P_n = 303.6\ k}$$

✓ JCM

PROB # 8-31

Using a W 18 X 130 ($Z_x = 290\ in.^3$)

$$M_n = F_y Z_x = \frac{(50)(290)}{12} = 1208.3\ ft\text{-}k$$



$$M_n(3.414\theta) = (30w)\left(\tfrac{1}{2}\right)(17.58\theta)$$

$$w_n = 0.012946\, M_n = (0.012946)(1208.3)$$

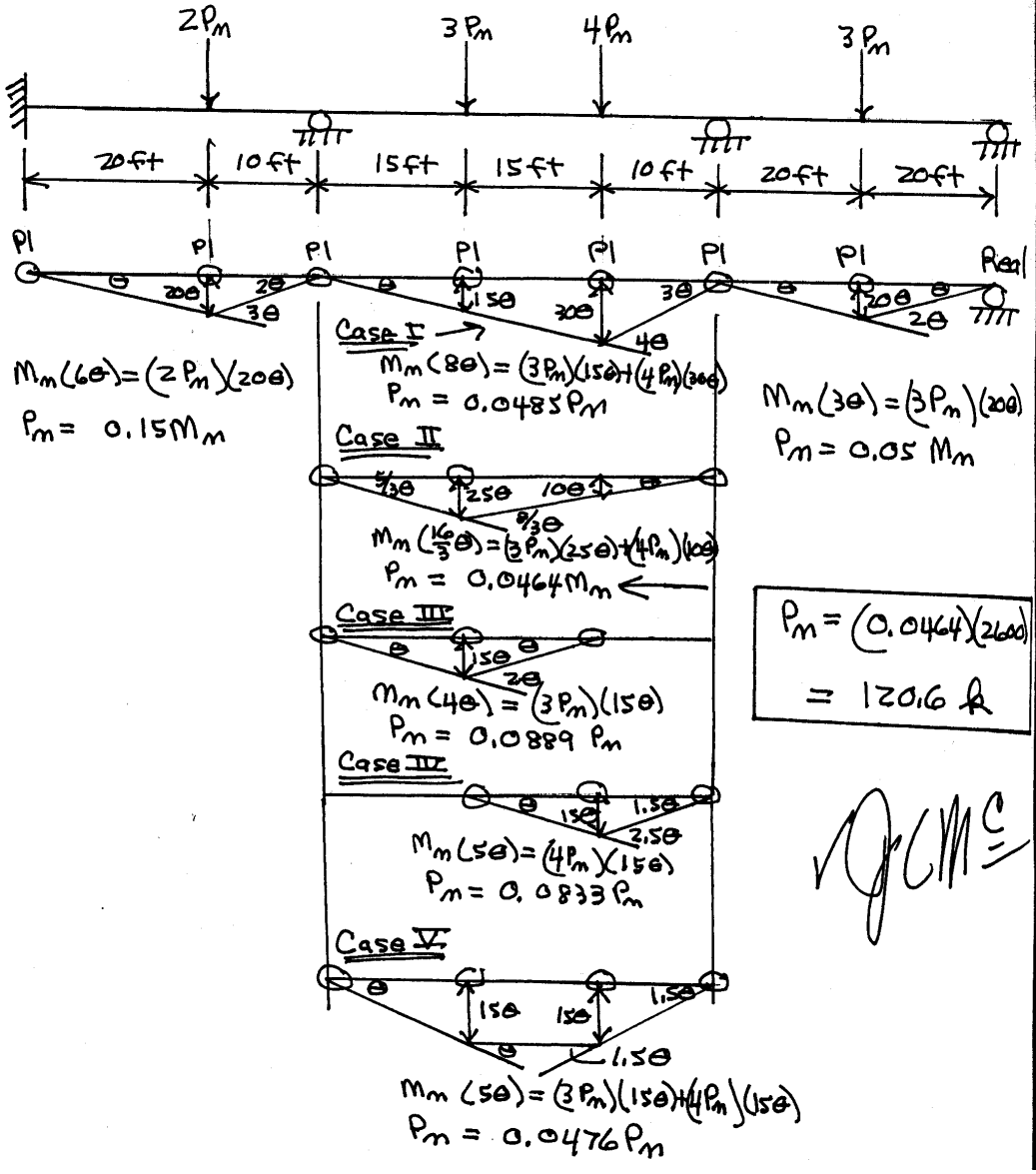
$$\boxed{w_n = 15.64\ k/ft}$$

✓ gcm

PROB # 8-37

using a W36X160 ($Z_x = 624$ in.^{3})

$$M_n = F_y Z_x = \frac{(50)(624)}{12} = 2600 \text{ ft-k}$$



$$P_n = (0.0464)(2600) = 120.6 \text{ k}$$

CHAPTER 9

PROB # 9-1

Assume beam wt = 90 lbs/ft

$w_u = (1.2)(1.29) + (1.6)(30) = 6.348$ k/ft

$M_u = \frac{(6.348)(36)^2}{8} = 1028.4$ ft-k

$Z\ \text{Reqd} = \frac{(12)(1028.4)}{(0.9)(50)} = 274.2\ \text{in.}^3$

USE W30X90

PROB #9-4

Assume beam wt = 84 lbs/ft

$w_u = (1.2)(1.584) = 1.90$ k/ft

$P_u = (1.6)(24) = 38.4$ k/ft

$M_u = (1.90)(16)(8) + (38.4)(8) + \left(\frac{38.4}{2}\right)(16)$

$= 857.6$ ft-k

$Z\ \text{Reqd} = \frac{M_u}{\phi_b F_y} = \frac{(12)(857.6)}{(0.9)(50)}$

$= 228.7\ \text{in.}^3$

USE W27X84