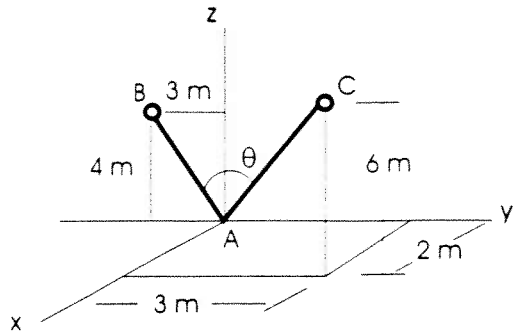
BE 50 Statics Final Examination – Spring Semester 1999
Exam Average – 75.44%

1. Determine the angle θ between the two cords AB and AC.



ANS: $\Theta = 64.6°$

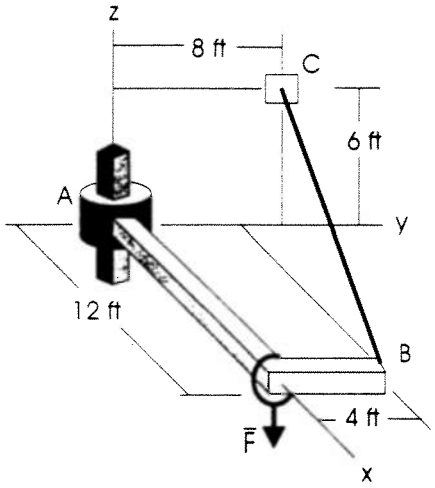
#2 ANS:

a) $12\hat{i} \times (-45\hat{k}) + (8\hat{j} + 6\hat{k}) \times T_{BC}\left(\frac{-12\hat{i}+4\hat{j}+6\hat{k}}{14}\right) = 0$

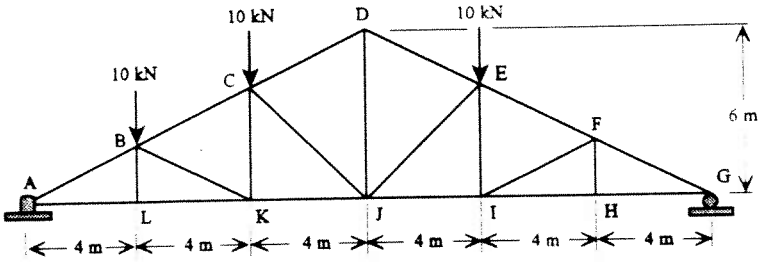
c) $\hat{u}_{BC} = \frac{-12\hat{i}+4\hat{j}+6\hat{k}}{14}$

d) $T_{BC} = 105$ Lb

2. Member AB is supported at B by a cable and at A by a smooth fixed square rod which fits loosely through the square hole of the collar.
a) draw and label a complete Free Body Diagram of member AB
b) write a moment equation (in vector form) about point A of member AB (don't solve)
c) find a unit vector for the cable from B to C
d) determine the tension in cable BC if the force $\bar{F} = -45\,\bar{k}$ (lb)



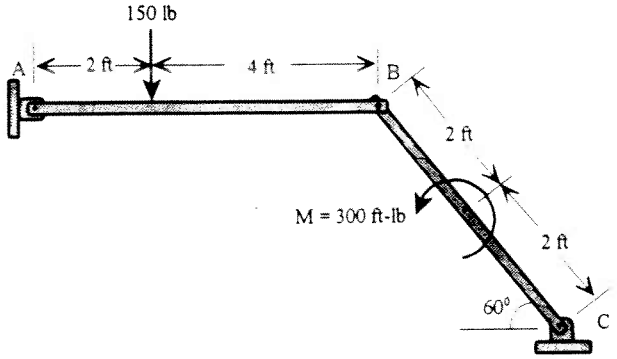
3. Determine the force in members CD and DJ of the Howe roof Truss loaded as shown. Indicate tension or compression. The given figure may be modified to draw an overall free body diagram.



ANS: CD = -18.64 kN (C)

DJ = 16.67 kN (T)

4. Determine the horizontal and vertical pin forces at A and B on member AB. Show answers on a sketch of the member.



ANS:

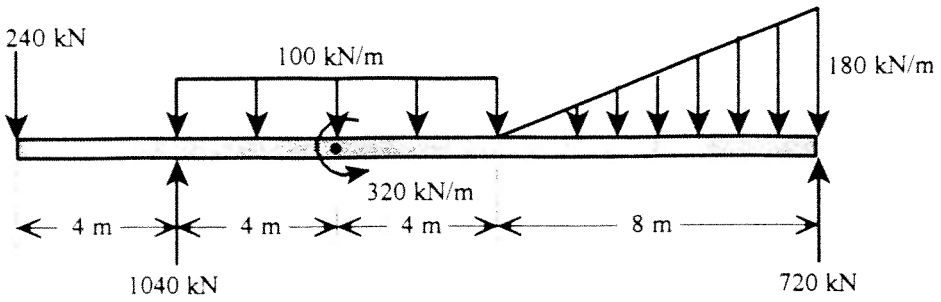
$A_x = 115.5$ Lb →

$A_y = 100$ Lb ↑

$B_x = 115.5$ Lb ←

$B_y = 50$ Lb ↑

5. Please draw the complete shear and bending moment diagrams for the beam loaded as shown. You must provide numerical values for all pertinent points on the diagrams.



PARTIAL ANS:

$V_4 = 800$ kN

$M_4 = -960$ kN·m

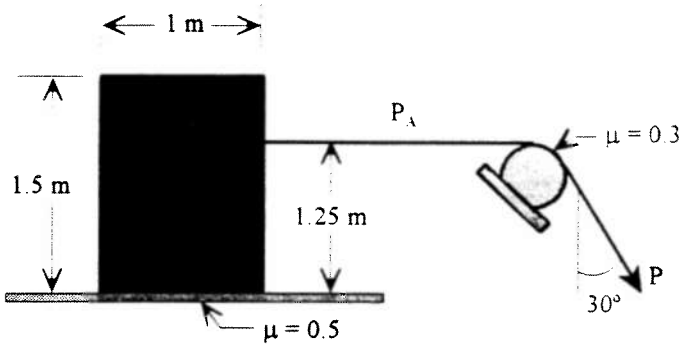
$M_{12} = 1920$ kN·m

6. What force P must be applied at the end of the rope to cause impending motion of the block? Will the block slip, tip, or slip and tip? What force P_A acts on the block itself? m = 30kg

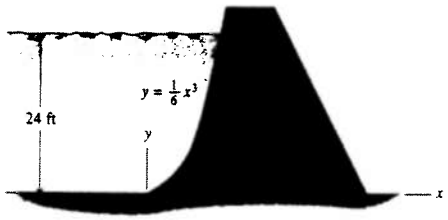
ANS:

$P_A = 117.7$ N

$P = 161.2$ N



7. Determine the magnitude of the horizontal and vertical components of the resultant force exerted by the water pressure on a 5 ft section of the dam. The specific weight γ of water is 62.4 lb/ft³.



ANS: $R_x = 89,856$ Lb

$R_y = 29,436$ Lb

8. Determine the area moment of inertia about the x-axis for the shaded area.

ANS:

$I_x = 37.7(10^6)$ mm⁴