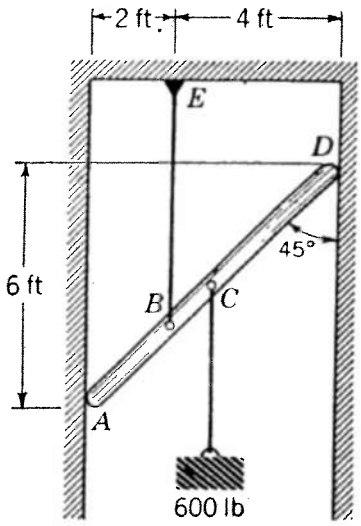
BE50 & 51 - STATICS FINAL
FS 2000

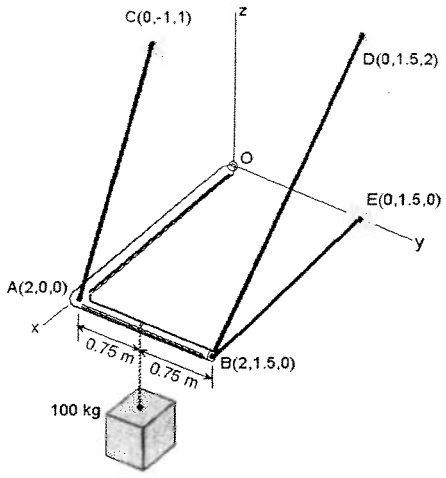
AVG = 78.1 %

1. A light bar AD is suspended from a cable BE and supports a 600 lb load at the mid-point C. The ends A and D of the bar are in contact with smooth vertical walls. Neglecting the weight of the bar, determine the tension in cable BE and the reactions at A and D.



ANS: BE = 600Lb ↑
D = 100Lb ←
A = 100Lb →

2. The right-angle boom OAB supports the 100 kg box. The boom is supported by three cables and a ball-and-socket joint at *O*. The cables are connected to points *C*, *D*, and *E*, which are all in the vertical *y*-*z* plane. The boom, which has negligible weight, is in the *x*-*y* plane. The point coordinates are given in units of meters.
   (a) Draw a free-body diagram for the boom by modifying the figure.
   (b) Find a unit vector along cable *BD*.
   (c) Find the tension in cable *BD*, T_{BD}.
   (d) Find the tension in cable *AC*, T_{AC}.

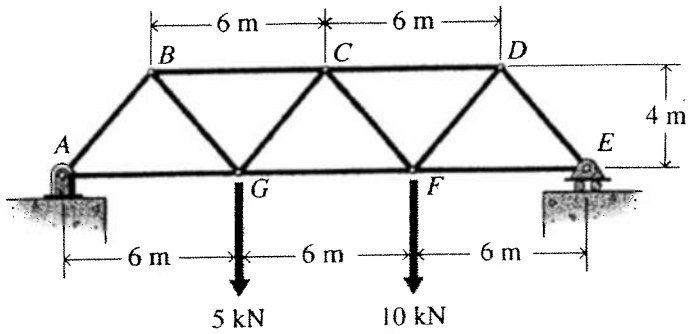


ANS: $\hat{u}_{BD} = \frac{-2\hat{i}+2\hat{k}}{\sqrt{8}}$

T_{BD} = 693.7 N

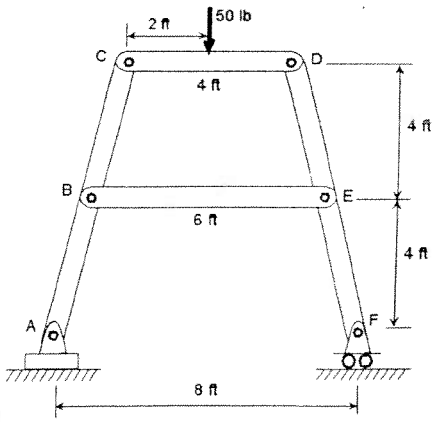
T_{AC} = 1201.5 N

3. Determine the forces in members CG and FG of the Warren bridge truss shown. State whether each member is in tension or compression.



ANS:
CG = 2.083 kN (C)
GF = 11.25 kN (T)

4. The structure is supported by a pin at A and a roller at F. Find the horizontal and vertical components of pin forces on member ABC. Show your answers on a sketch of member ABC.



ANS: $A_x = 0$
A_y = 25 Lb ↑
BE = 12.5 Lb →
C_x = 12.5 Lb ←
C_y = 25 Lb ↓
all on AC

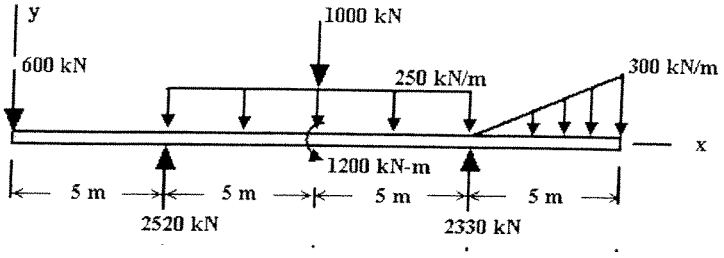
Partial Ans:

$M_5 = -3000$ kN·m

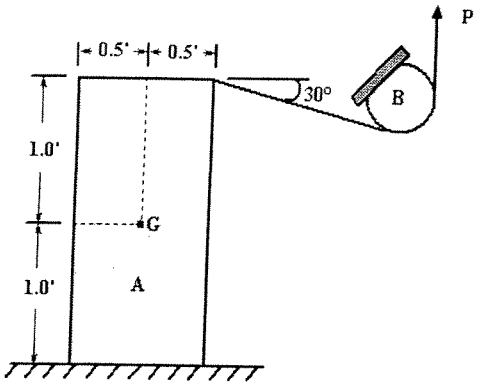
$M_{10} = 3475$ kN·m

$M_{15} = -2500$ kN·m

5. Draw the complete shear force and bending moment diagrams for the beam loaded as shown. All loading and non-zero reactions are shown. Label all pertinent points on each diagram and give the order of curves.



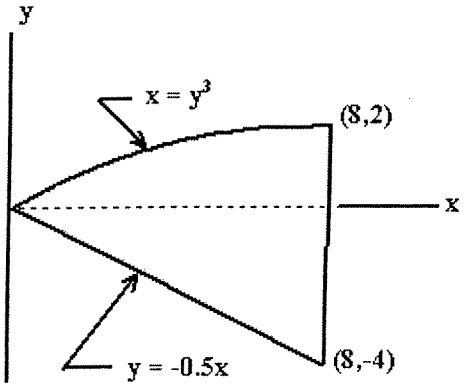
6. Determine the maximum force P for which the system will remain in equilibrium. Block A weighs 100 lb and the coefficient of static friction is 0.25 between the block and plane and between the belt and fixed peg.



Ans:

$P = 48.73$ Lb

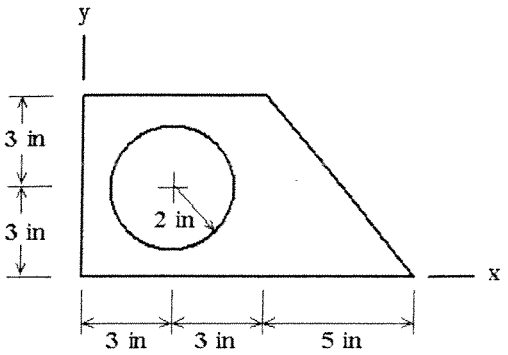
7. Determine the x-coordinate to the centroid of the shaded area. All lengths are in inches.



Ans:

$\bar{x} = 5.007$"

8. Determine the moment of inertia of the shaded area with respect to the x-axis.



Ans:

$I_x = 396.3$ in^4