UNIVERSITY of ARKANSAS
1871

MEEG 2003 **Name:** _____

(Underline your **last name**.)

Test I ( ) **ID#:** _____

1. (30%) A 60-N force **F** acts at the end *D* of a pipeline as shown. Determine (*a*) the moment $\mathbf{M}_A$ of the force **F** about the joint at *A*, (*b*) the moment M_{AB} of **F** about the axis of the pipe *AB*, (*c*) whether the action of **F** tends to tighten or loosen the joint at *A* where the threads are right-handed, (*d*) the shortest distance d_{S1} between the point *A* and the line of action of **F**, (*e*) the shortest distance d_{S2} between the line containing *AB* and the line of action of **F**.

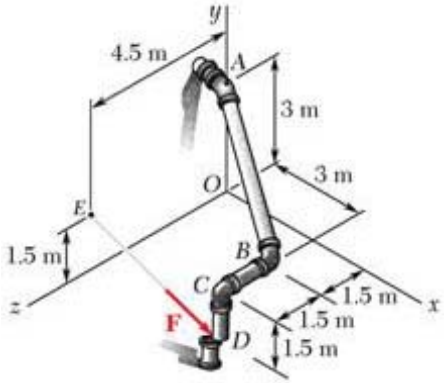


Fig. P1

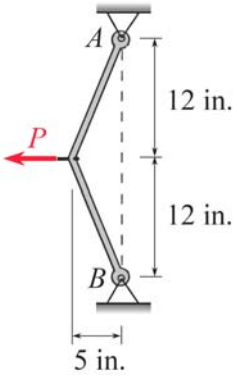


Fig. P2

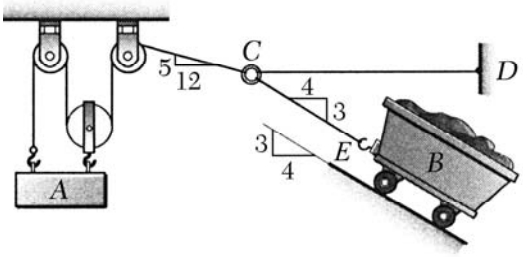


Fig. P3 *A*, *B*, *C*

2. (30%) An elastic cord with spring modulus k = 52 lb/in. is held in equilibrium by an applied force **P** as shown. Knowing that the tension in the cord is 124.8 lb when the cord is stretched directly between the supports *A* and *B*, determine (*a*) the free length *L* of the cord, (*b*) the magnitude *P* of the applied force.

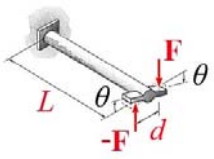
3. The system shown is in equilibrium, and the tension in the cable *CD* is known to be 240 lb. *Circle on this test sheet* the nearest item for each of the following:

A. (5%) The tension in the cable *CE* is
(a) 75 lb. *(b)* 150 lb. *(c)* 225 lb. *(d)* 300 lb. *(e)* 375 lb. *(f)* 450 lb. *(g)* 525 lb.

B. (5%) The weight of cart *B* is
(a) 875 lb. *(b)* 750 lb. *(c)* 625 lb. *(d)* 500 lb. *(e)* 375 lb. *(f)* 250 lb. *(g)* 125 lb.

C. (5%) The weight of block *A* is
(a) 702 lb. *(b)* 1053 lb. *(c)* 1228 lb. *(d)* 1404 lb *(e)* 1580 lb. *(f)* 1755 lb. *(g)* 1930 lb.

D. (5%) The angle of twist (in radians) of a circular shaft, as shown, is given by $\theta = TL/(JG)$, where $T = Fd$, F = 257 lb, d = 4 in., L = 300 mm, $J = 10^4$ mm^4, and $G = 3.7 \times 10^6$ psi. The value of θ in degrees is
(a) 7.58˚. *(b)* 7.67˚. *(c)* 7.70˚. *(d)* 7.73˚. *(e)* 7.77˚. *(f)* 7.80˚. *(g)* 7.83˚.



4. ***A.*** Define the **units**: (*a*) 1 lb *in terms of* pound-mass (lbm), (*b*) 1 lbm *in terms of* kilogram (kg). ⑤

B. Describe **Newton's third law**. ⑤

C. Including a sketch, define the vector **r** in the formula $\mathbf{M}_P = \mathbf{r} \times \mathbf{F}$ for computing the moment $\mathbf{M}_P$ about point *P* of a force **F** acting at point *A*. ⑤

D. Including a sketch, define the vectors $\boldsymbol{\lambda}_{BC}$ and **r** in the formula $M_{BC} = \boldsymbol{\lambda}_{BC} \cdot (\mathbf{r} \times \mathbf{F})$ for computing the moment M_{BC} about axis *BC* of a force **F** acting at point *A*. ⑤