UNIVERSITY of ARKANSAS
1871

MEEG 2003 **Name:** _____

(Underline your **last name**.)

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

1. (30%) The weights of collars *A* and *B* are W_A = 60 lb and W_B = 90 lb, respectively. If the effect of friction is negligible and equilibrium of the system as shown exists, determine (*a*) the tension T_{AB} in the connecting cable *AB*, (*b*) the reaction **A** exerted on the collar *A* by the rod, (*c*) the reaction **B** exerted on the collar *B* by the rod.

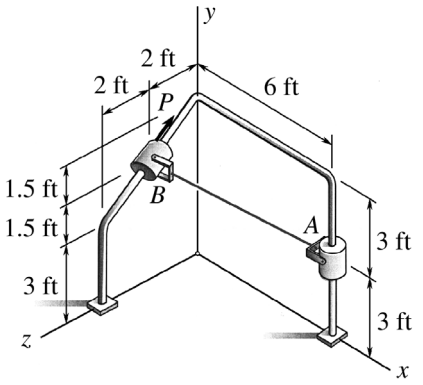

Fig. P1

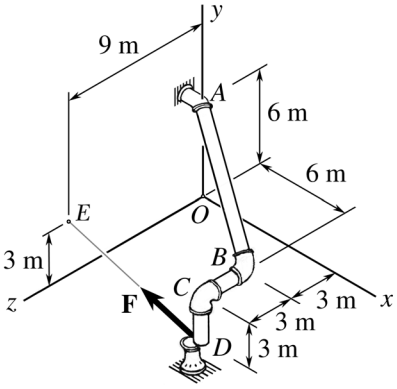

Fig. P2

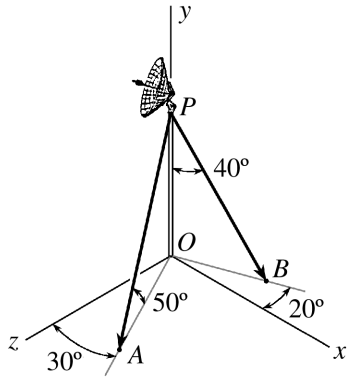

Fig. P3

2. (30%) A 90-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**.

3. (20%) The tensions in the guy wires *PA* and *PB*, attached to a pole supporting a dish antenna as shown, are T_{PA} = 495 N and T_{PB} = 600 N, respectively. Let the resultant of $\mathbf{T}_{PA}$ and $\mathbf{T}_{PB}$ at *P* be **R** and $\mathbf{R} = R_x\mathbf{i} + R_y\mathbf{j} + R_z\mathbf{k}$. Circle on this test sheet the correct or nearest item for each of the following:

A. The value of R_x is

(*a*) 520 N. (*b*) 522 N. (*c*) 523 N. (*d*) 525 N. (*e*) 526 N.

B. The value of R_y is

(*a*) –854 N. (*b*) –850 N. (*c*) –846 N. (*d*) –843 N. (*e*) –839 N.

C. The value of R_z is

(*a*) 152.0 N. (*b*) 149.2 N. (*c*) 146.4 N. (*d*) 143.6 N. (*e*) 140.9 N.

D. The rate of flow of oil in a pipeline is *Q* = 82 bbl/min. It is known that 1bbl = 42 gal, 1 gal = 231 in^3, and 1 m^3 = 1000 L. In SI, this value of *Q* is equivalent to

(*a*) 217 L/s. (*b*) 223 L/s. (*c*) 228 L/s. (*d*) 233 L/s. (*e*) 238 L/s.

4. *A*. (10%) Describe the **rigid-body principle** versus the **principle of transmissibility**.

B. (10%) The **moment** of a force **F** about a point *P* is actually the same as the **moment** of this force **F** about a specific axis. Describe the *location* and the *orientation* of this **specific axis**.