1. (15%) Explain the following terms briefly:

    a). mechanics

    b). moments of inertia

    c). principle of virtual work

2. (5%) What is the major difference between *statics* and *dynamics*?

3. (20%) Determine the forces in members FH and GI of the roof truss shown in figure 1.

4. (20%) The cable AE supports three vertical loads from the points indicated in figure 2. If point C is 5m below the left support, determine the elevations of point B and D

5. (20%) The movable bracket shown in figure 3 may be placed at any height on the 3in-diameter pipe. If the coefficient of the static friction between the pipe and bracket is 0.25, determine the minimum distance x at which the load w can be supported. (Neglect the weight of the bracket.)

6. (20%) A flat belt passes two idler pulleys and under a rotating drum of diameters 8in as shown in figure 4. The axle of the drum is free to move vertically in a slot, and a spring keeps the drum in contact with the belt. What is the minimum force which should be exerted by the spring if slippage is not to occur when a 30lb-ft torque is applied to the drum? The coefficient of static friction between belt and drum is 0.3 and the weights of the drum, belt and spring could be neglected.
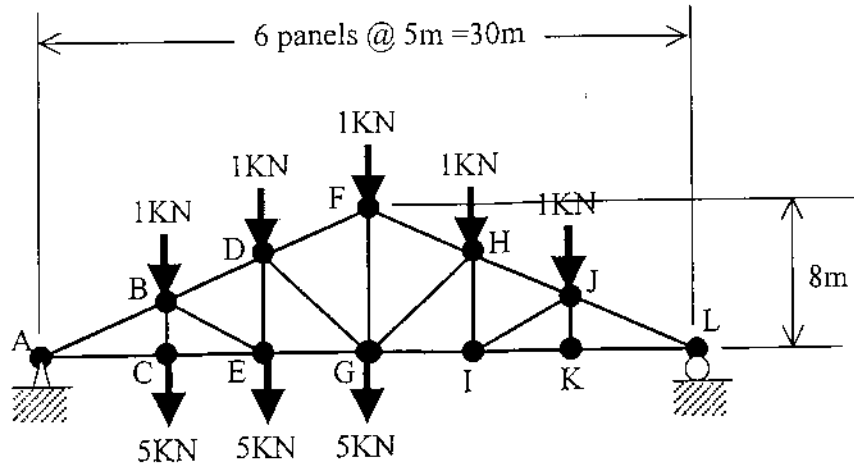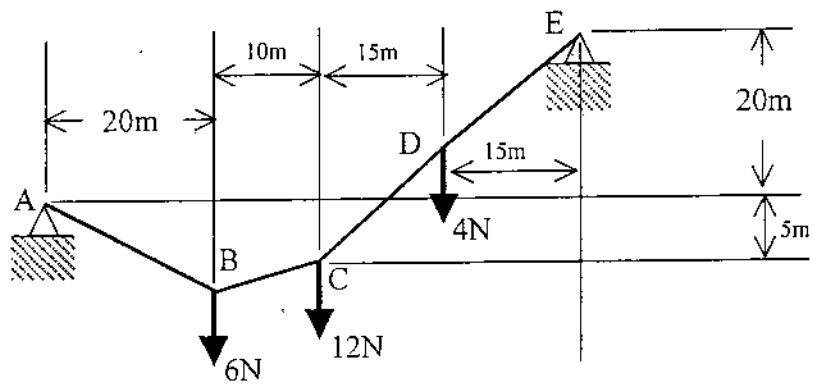
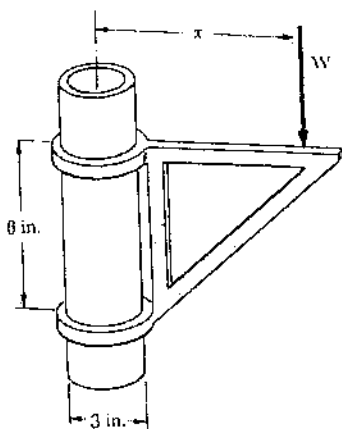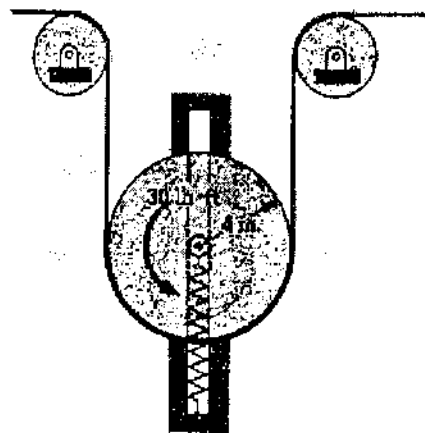   (Hint: $\ln\dfrac{T_2}{T_1} = \mu_s\beta$)

figure 1

figure 2

figure 3

figure 4