1. A beam is loaded and supported as shown in **Fig. 1**. Draw the shear and moment diagrams for the beam. (25%)

2. A hollow steel shaft with an outside diameter of 400 mm and an inside diameter of 300 mm is subjected to a torque of 300 kN*m as shown in **Fig. 2**. The shear modulus for the steel is 80 GPa. Determine
   (a) The maximum shearing stress in the shaft. (10%)
   (b) The shearing stress on the transverse cross section at the inside surface of the shaft. (10%)
   (c) The magnitude of the angle of twist in a 2-m length. (5%)

3. A continuous cable is used to support two blocks as shown in **Fig. 3**. Block A is supported by a small wheel that is free to roll on the cable. Determine the displacement y of block A for equilibrium if the weights of blocks A and B are 300 KN and 400 KN, respectively. (Assume the whole system is smooth without friction.) (25%)

4. An element is shown in **Fig. 4**. Determine the following:
   (a) Major and minor principal stresses (10%)
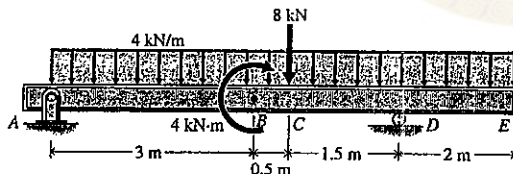   (b) Normal and shear stresses on the plane AB (15%)
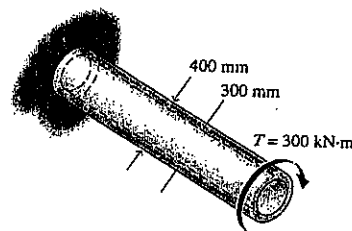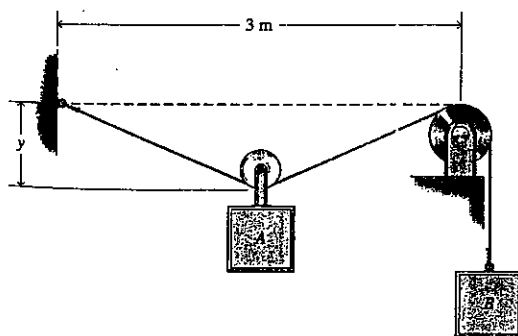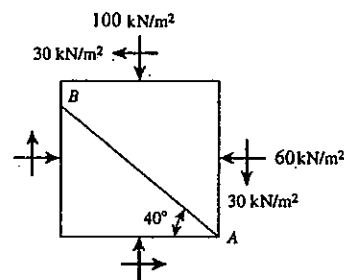

Fig.1

Fig.2

Fig.3

Fig.4

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