國立雲林科技大學 109 學年度 碩士班招生考試試題

系所：機械系

科目：材料力學

1. During a tension test of a mild-steel specimen (see Figure 1), the extensometer shows an elongation of 0.004 mm with a gage length of 50 mm. Assume that the steel is stressed below the proportional limit and that the modulus of elasticity E = 210 GPa.
   (a) (10%) Determine the maximum normal stress in the specimen.
   (b) (5%) Determine the maximum shear stress in the specimen.
   (c) (10%) Draw a stress element oriented at an angle of 45° to the axis of the bar and show all stresses acting on the faces of this element.

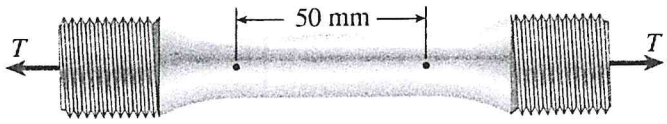

Figure 1

2. In Figure 2, the post in soil is has a diameter of 60 mm. If it is subjected to the load of 20 kN and the soil provides a frictional resistance that is uniformly distributed along its sides of w = 4 kN/m. The modulus of elasticity of the post E = 13.1 GPa.
   (a) (10%) Determine the force **F** at its bottom needed for equilibrium.
   (b) (15%) Determine the displacement of the top of the post A with respect to its bottom B.

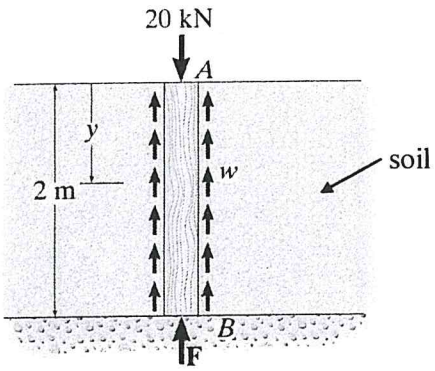

Figure 2

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3. (25%) A ship has a propeller drive shaft that is turning at 1200 rev/min while developing 1500 kW. If it is 2 m long and has a diameter of 80 mm, determine the maximum shear stress in the shaft caused by torsion.

4. (25%) The supports at A and B exert vertical reactions on the wood beam. If the allowable shear stress is τ_{allow}= 100MPa, determine the intensity w of the largest distributed load that can be applied to the beam. (See Figure 3)

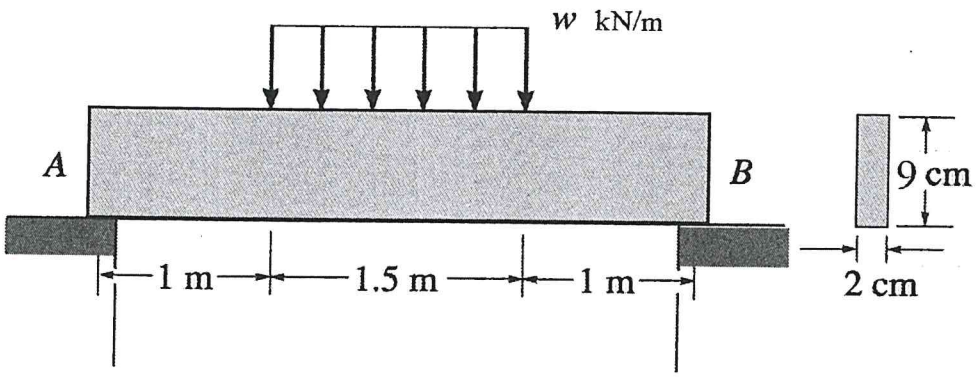

Figure 3