

國立成功大學  
110學年度碩士班招生考試試題

編 號： 72

系 所： 機械工程學系

科 目： 材料力學

日 期： 0202

節 次： 第 1 節

備 註： 可使用計算機

※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. The state of a uniform plane stress as shown in Fig. 1. It can be described by  $\sigma_a=100\text{MPa}$ ,  $\sigma_b=200\text{MPa}$ , and  $\tau_a=400\text{MPa}$ . Determine the values of  $\sigma_c$ ,  $\tau_b$ , and  $\tau_c$ . (20%)

2. A soft material is placed within the confines of a rigid cylinder which rests on a rigid support in Fig. 2. Determine the factor by which the stiffness of the material, or the apparent modulus of elasticity, will be increased when a load is applied, if  $\nu = 0.4$  for the material. (15%)

3. If the shaft is subjected to a uniform distributed torque of  $t = 20 \text{ kN}\cdot\text{m}/\text{m}$  in Fig. 3. Determine the maximum shear stress developed in the shaft. The shaft is made of 2014-T6 aluminum alloy and is fixed at A and C. (15%)

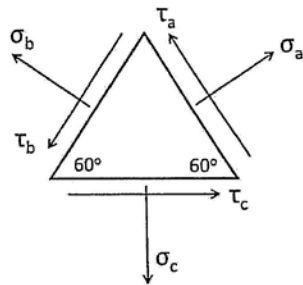


Fig. 1

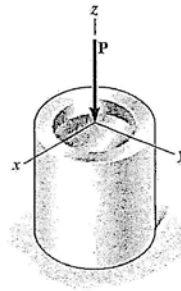


Fig. 2

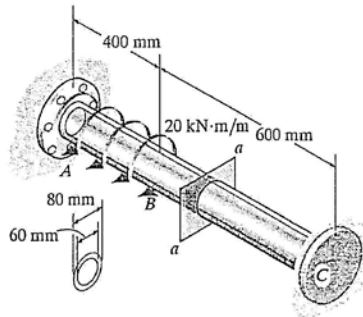
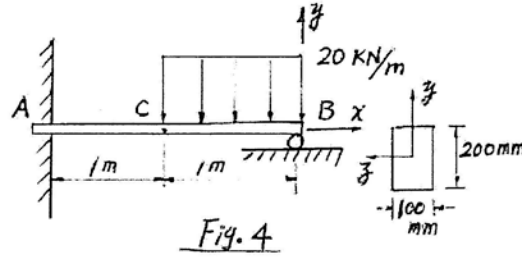


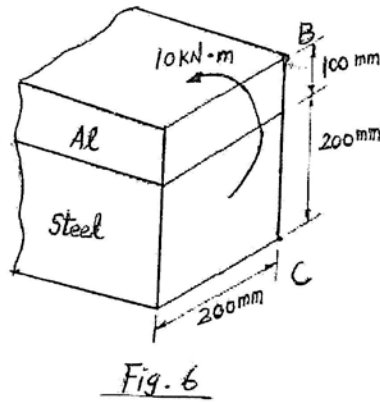
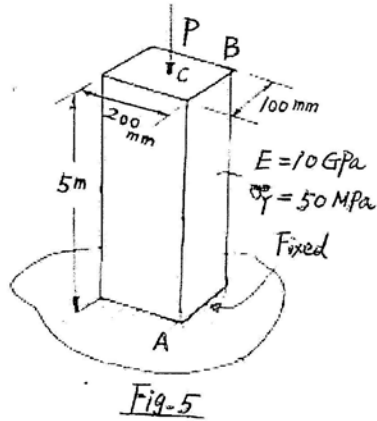
Fig. 3

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4. As shown in Fig. 4, (a) determine the reactions at the supports  $A$  and  $B$ , (b) draw the shear and moment diagrams, (c) determine the maximum bending stress and maximum shear stress at  $A$ , as well as the deflection at  $C$ . If the size of rectangular cross section of the beam is  $100\text{ mm} \times 200\text{ mm}$ , and  $E=150\text{ GPa}$ . (25%)



5. The wood column is fixed at its base  $A$  and free at its top  $B$ , as shown in Fig. 5. Determine the load  $P$  that can be applied to the centroid of cross section of column  $C$  without causing the column to fail either by buckling or by yielding.  $E=10\text{ GPa}$ ,  $\sigma_Y = 50\text{ MPa}$ . (10%)



6. A composite beam made of Al and steel is subjected to a bending moment  $M = 10\text{ kN}\cdot\text{m}$ , as shown in Fig. 6. Determine the normal stress at points  $B$  and  $C$ . ( $E_{st}=200\text{ GPa}$ ,  $E_{al} = 100\text{ GPa}$ ). (15%)