國立彰化師範大學103學年度碩士班招生考試試題
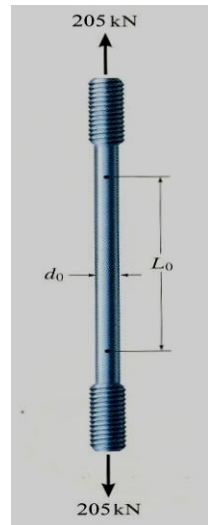
系所：　　工業教育與技術學系　　組別：　乙組(選考乙)　　科目：　材料力學

1. An aluminum rod with diameter (d_0) 30 mm and gauge length (L_0) 300 mm, as shown in Fig. 1. If a force of 205 kN elongates the gauge length 1.8 mm, determine (a) the modulus of elasticity, (b) the force that cause a lateral contract. Take G_{al} = 25.7 GPa and σ_Y = 428 MPa. (20%)
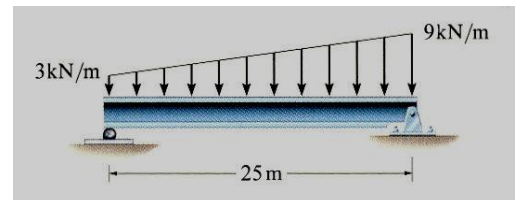

(Fig. 1)

2. A solid shaft AB is to be used to transmit 2800 W from the motor M, as shown in Fig. 2. If the shaft rotates at 220 rpm and has an allowable shear stress 135 MPa, determine the required diameter of the shaft. (15%)

(Fig. 2)
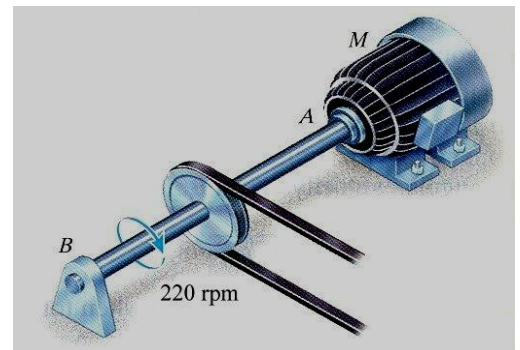
3. Draw the shear and moment diagrams for the beam shown in Fig. 3, and calculate the values of shear and moment at each critical point. (15%)

(Fig. 3)

4. A pressurized spherical tank is to be made of 12-mm-thick steel. If it is subjected to an internal pressure of p = 1.4 MPa, determine its outer radius if the maximum normal stress is not to exceed 110 MPa. (15%)

5. An A-36 steel bar has a length of 1280 mm and cross-sectional area of 430 mm^2. Determine the length of the bar if it is subjected to an axial tension of 25kN. The material has linear-elastic behavior. Take σ_Y = 250 MPa and E_{st} = 200GPa. (15%)

6. The strain at a point on a pressure-vessel wall has components of $\varepsilon_x = 350\ (10^{-6})$, $\varepsilon_y = -460\ (10^{-6})$, $\gamma_{xy} = -560\ (10^{-6})$, $\varepsilon_z = 0$. Determine (a) the principal strains at the point, (b) the maximum shear strain in the x-y plane. (20%)