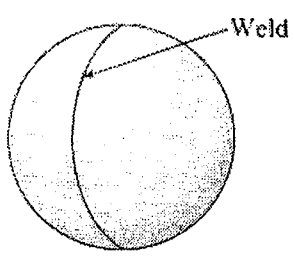
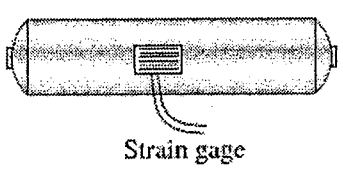
注意：請依題號順序作答

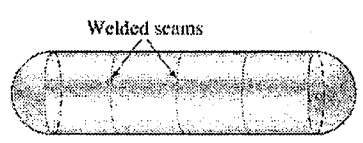
1. (20 Points) Multiple-choice questions (每小題答對得 4 分，未作答得 0 分，答錯倒扣 2 分)
   (1) A thin wall spherical tank of diameter 0.75 m has internal pressure of 20 MPa. The yield stress in tension is 920 MPa, the yield stress in shear is 475 MPa, and the factor of safety is 2.5. The modulus of elasticity is 210 GPa, Poisson's ratio is 0.28, and maximum normal strain is 1220×10^{-6}. The minimum permissible thickness of the tank is approximately: (A) 8.6 mm (B) 9.9 mm (C) 10.5 mm (D) 11.1 mm
   (2) The pressure relief valve is opened on a thin wall cylindrical tank, with radius to wall thickness ratio of 128, thereby decreasing the longitudinal strain by 150×10^{-6}. Assume that the modulus of elasticity is 73 GPa and Poisson's ratio is 0.33. The original internal pressure in the tank was approximately: (A) 370 kPa (B) 450 kPa (C) 500 kPa (D) 590 kPa
   (3) A cylindrical tank is assembled by welding steel sections circumferentially. Tank diameter is 1.5 m, thickness is 20 mm, and internal pressure is 2.0 MPa. The maximum shear stress in the cylindrical part of the tank is approximately: (A) 17 MPa (B) 26 MPa (C) 34 MPa (D) 38 MPa
   (4) A cylindrical tank is assembled by welding steel sections in a helical pattern with angle $\alpha = 50°$. Tank diameter is 1.6 m, thickness is 20 mm, and internal pressure is 2.75 MPa. Young's Modulus is 210 GPa and Poisson's ratio is 0.28. The circumferential strain in the wall of the tank is approximately: (A) 1.9×10^{-4} (B) 3.2×10^{-4} (C) 3.9×10^{-4} (D) 4.5×10^{-4}
   (5) A cylindrical tank is assembled by welding steel sections in a helical pattern with angle$\alpha = 50°$. Tank diameter is 1.6 m, thickness is 20 mm, and internal pressure is 2.75 MPa. Young's Modulus is 210 GPa and Poisson's ratio is 0.28. The longitudinal strain in the the wall of the tank is approximately: (A) 1.2×10^{-4} (B) 2.4×10^{-4} (C) 3.1×10^{-4} (D) 4.3×10^{-4}
2. (20 Points) The beam is constructed from three boards as shown. If each nail can support a shear force of 225 N, determine the maximum spacing of the nails, s, s', s'', for regions AB, BC, and CD, respectively.
3. (20 Points) The A-36 steel post is subjected to the forces shown. If the strain gauges a and b at point A give readings of $\varepsilon_a = 300 \times 10^{-6}$ and $\varepsilon_b = 175 \times 10^{-6}$, determine the magnitudes of $\mathbf{P}_1$ and $\mathbf{P}_2$.
4. (20 Points) The center rod CD of the assembly is heated from $T_1 = 30°C$ to $T_2 = 180°C$ using electrical resistance heating. At the lower temperature T_1 the gap between C and the rigid bar is 0.7 mm. Determine the force in rods AB and EF caused by the increase in temperature. Rods AB and EF are made of steel, and each has a cross-sectional area of 125 mm^2. CD is made of aluminum and has a crosssectional area of 375 mm^2. $E_{st} = 200$ GPa, $E_{al} = 70$ GPa, and $\alpha_{al} = 23 \times 10^{-6}/°C$.
5. (20 Points) For the beam and loading shown, determine the spring constant k for which the force in the spring is equal to one-third of the total load on the beam.



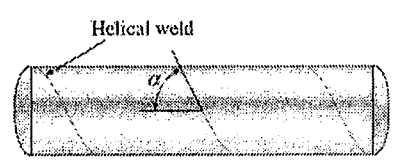
Problem 1 (1)



Problem 1 (2)



Problem 1 (3)



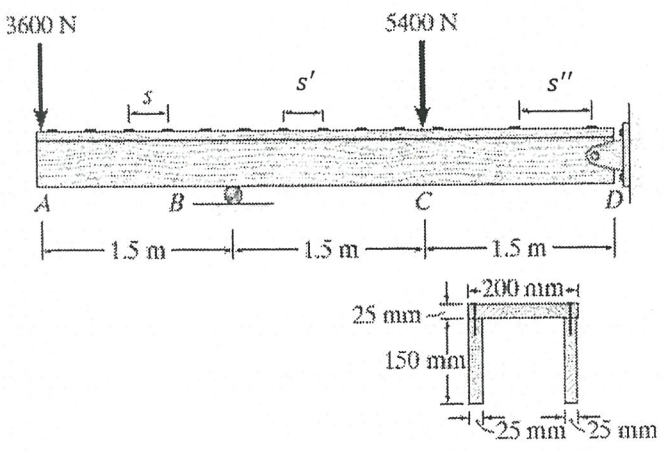
Problem 1 (4), (5)

見背面

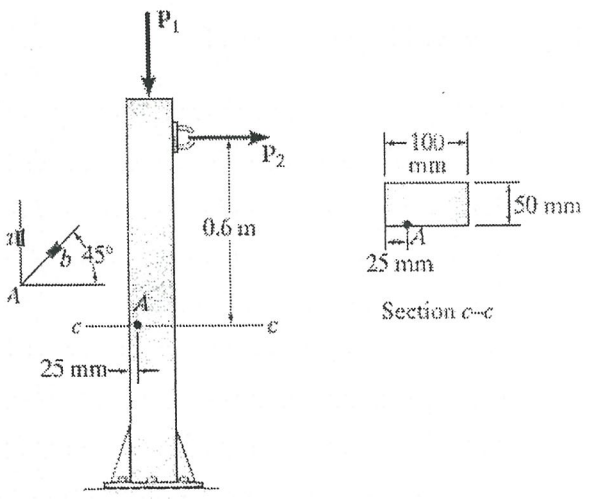
題號： 347　　國立臺灣大學 108 學年度碩士班招生考試試題

科目： 材料力學(F)

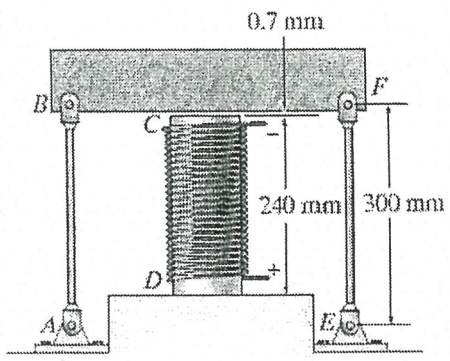
節次： 2



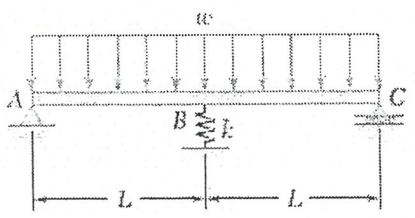
Problem 2



Problem 3



Problem 4



Problem 5

試題隨卷繳回