國立成功大學

111學年度碩士班招生考試試題

編　號：73

系　所：機械工程學系

科　目：材料力學

日　期：0219

節　次：第 1 節

備　註：可使用計算機

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1. The frame is subjected to a horizontal force and couple moment as shown in Fig. 1. Determine the principal stresses and the absolute maximum shear stress at point A. (20%)

2. Initially, gaps between the A-36 steel plate and the rigid constraint are as shown in Fig. 2. It is stress-free in z direction. $E_{A\text{-}36}$, $\alpha_{A\text{-}36}$ and $\nu_{A\text{-}36}$ are $29(10^3)$ kip/in^2, $6.60(10^{-6})$/°F and 0.32, respectively. Determine the normal stresses σ_x and σ_y in the plate if the temperature is increased by $\Delta T = 100$°F. (15%)

3. Due to a fabrication error the inner circle of the tube is eccentric with respect to the outer circle (Fig. 3). By what percentage is the torsional strength reduced when the eccentricity e is one-fourth of the difference in the radii? (15%)

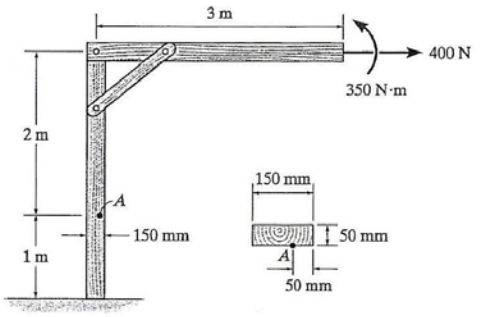

Fig. 1

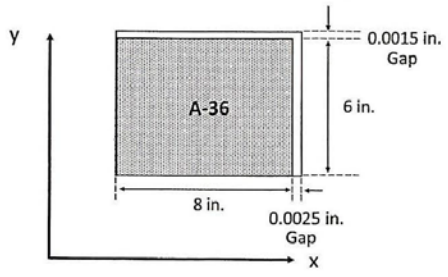

Fig. 2

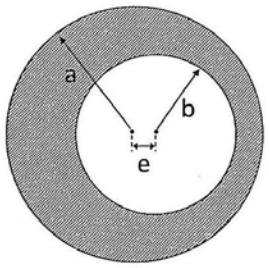

Fig. 3

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4. As shown in Fig.4, determine the reactions at the supports *A* and *B*, then draw the shear force and bending moment diagrams. *EI* is constant. (18%)

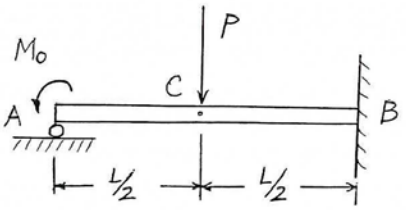

Fig. 4

5. The thin-walled box beam, as shown in Fig.5, is subjected to a shear force of 8 kN and a bending moment of 12 kN · m. Determine the stress states at locations *A* and *B*, respectively, if the shear stress is uniformly distributed along the thickness. (20%)

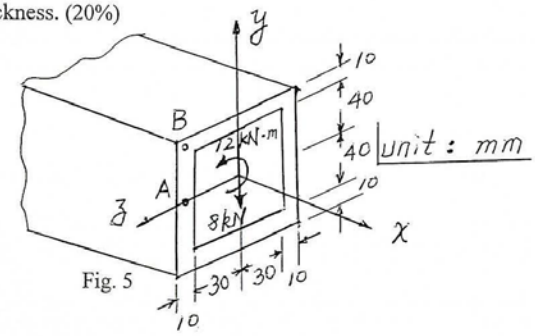

Fig. 5

6. As shown in Fig.4, determine the reactions at the supports *A* and *B* by Castigliano's theorem. (12%)