

國立臺北科技大學九十五學年度碩士班招生考試

系所組別：1202 製造科技研究所不分組

第二節 材料力學（選考）試題

填 准 考 證 號 碼

第一頁 共一頁

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注意事項：

1. 本試題共四題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. A beam ABCDE has simple supports at B and D and symmetrical overhangs at each end (see Fig. 1). Determine (a) the ratio b/L so that the deflection δ_c at the middle of the beam is equal to the deflection δ_A and δ_E at the ends. (b) the ratio b/L so that the slope θ_A and θ_B at the ends equals to zero. (25%)
2. The Z section shown is subjected to a couple M_o acting in a vertical plane (see Fig. 2). Determine the largest permissible value of the moment M_o of the couple if the maximum stress is not to exceed 90 MPa. ($I_{max}=2.28 \times 10^6 \text{ mm}^4$, $I_{min}=0.23 \times 10^6 \text{ mm}^4$, principal axes 25.7° clockwise and 64.3° counterclockwise). (25%)
3. A pressurized steel tank is constructed with a helical weld that makes an angle $\alpha=60^\circ$ (see Fig. 3). The tanks has radius $r=0.5$ m, wall thickness $t=12$ mm, and internal pressure $p=3.2$ Mpa. The steel $E=200$ GPa, ν (poison's ratio)=0.30. Determine the following quantities for the cylindrical part of the tank: (a) the circumferential and longitudinal stresses. (b) the maximum in-plane and out-of-plane shear stresses, (c) the circumferential and longitudinal strains, (d) the normal and shear stresses acting on planes parallel and perpendicular to the weld. (25%)
4. A beam of square cross section (a = length of each side) is bent in the plane of a diagonal (see Fig. 4), By removing a small amount of material at the top and bottom corners, as shown by the shaded triangles in the figure, we can increase the section modulus and obtain a stronger beam. (a) Determine the ratio β defining the areas that should be removed in order to obtain the strongest cross section in bending. (b) By what percent is section modulus increased when the areas are moved? (25%)

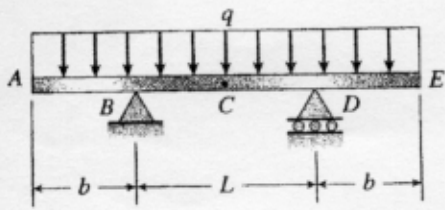


Fig.1

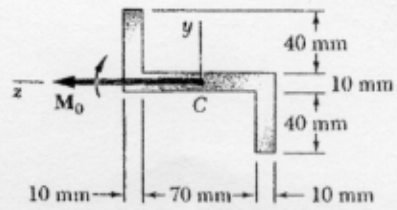


Fig.2

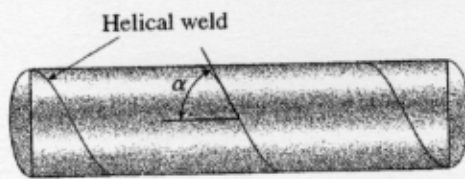


Fig.3

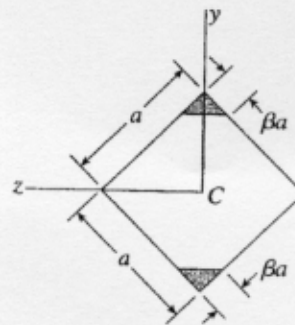


Fig.4