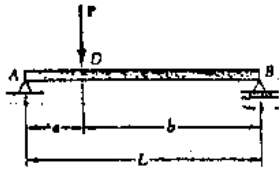


國立中央大學八十六學年度碩士班研究生入學試題卷

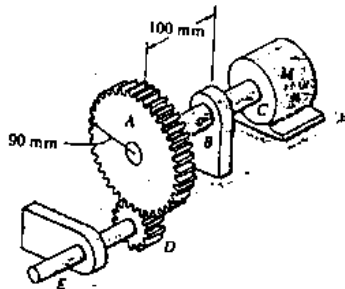
所別： 機械工程研究所 乙組 科目： 機械材料及材料力學 共 2 頁 第 1 頁

(一) (25%)
(1)

- (a) Taking into account only the effect of normal stresses due to bending, determine the strain energy of the prismatic beam AB for the loading shown (6%)
- (b) Evaluate the strain energy, knowing that the beam is a W250 × 67, $P=180\text{kN}$, $L=3.6\text{m}$, $a=0.9\text{m}$, $b=2.7\text{m}$, and $E=200\text{GPa}$ (6%)



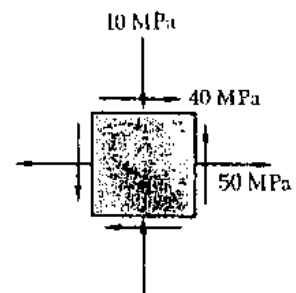
- (2) The solid shaft ABC and the gears shown are used to transmit 7.5kW from the motor M to a machine connected to gear D. Knowing that the motor rotates at 240 r/min and that $\tau_{all} = 45\text{MPa}$, determine the required diameter of shaft ABC. (13%)



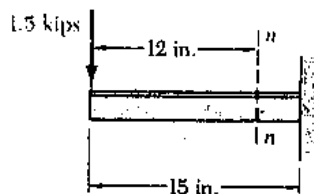
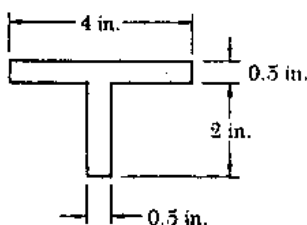
(二) (25%)

- (1) A shaft has a cross-sectional area of 4 in^2 , length of 25 in., and subjected to a torque of 3000 lb-in. Determine the maximum shear stress and the angle of twist developed in the shaft with circular cross section and $G = 12000\text{ ksi}$. (7%)

- (2) For the state of plane stress shown in Fig., determine (a) the principal planes, (b) the principal stresses, (c) the maximum shear stress and the corresponding normal stress. (8%)



- (3) A machine part has a T-shaped cross section and is acted upon in its plane of symmetry by the single force shown. Determine (a) the maximum compressive stress at section n-n, (b) the maximum shear stress. (10%)



參考用

背面有試題

國立中央大學八十六學年度碩士班研究生入學試題卷

所別: 機械工程研究所 乙組 科目: 機械材料及材料力學 共 2 頁 第 2 頁

(三) Answer the questions and give proper interpretation: (17 %)

- (a). Which metal is less ductile between copper and zinc? (3%)
- (b). Is $\{111\}$ and $\langle 110 \rangle$ a good slip system for fcc metal or for bcc one? (3%)
- (c). Is the inverse lever rule useful for the homogeneous system or the heterogeneous one? (3%)
- (d). Is the melting point of Pb-Sn alloy higher or lower than that of both the pure components? (3%)
- (e). Comparing the diffusivity of silver self-diffusion, is it for single crystal higher than that for poly-crystalline silver? (3%)
- (f). Can an amorphous metal material be obtained? (2%)

(四) (17%)

1. Give two methods of lowering the recrystallization temperature of given metals. (4%)
2. Describe two methods of making a single crystal. (4%)
3. Give three methods of making a fine-grain crystal. (5%)
4. Give two different methods of obtaining a spheroidized cementite structure. (4%)

(五) (16%)

1. Explain the difference between engineering stress and true stress.
Describe the relation between engineering strain and true strain.
(8%)
2. Differentiate between brittle and ductile fracture. (4%)
3. Describe the mechanism of fatigue failure. (4%)