

八十五學年度動力機械工程研究所(所) 丙 組碩士班研究生入學考試

科目 材料力學 科號 2701 共 2 頁第 1 頁 *請在試卷【答案卷】內作答

1. Explain the following terminologies. (20%, 每小題 5 分)

- (a) plane stress;
- (b) lower yield point;
- (c) dilatation;
- (d) stress concentration.

2. The C clamp in Fig. 2 is tightened until $P = 4 \text{ kN}$. If $h = 1.6b = 80 \text{ mm}$, calculate

- (a) the maximum normal stress and
- (b) the location of the neutral axis. (20%)

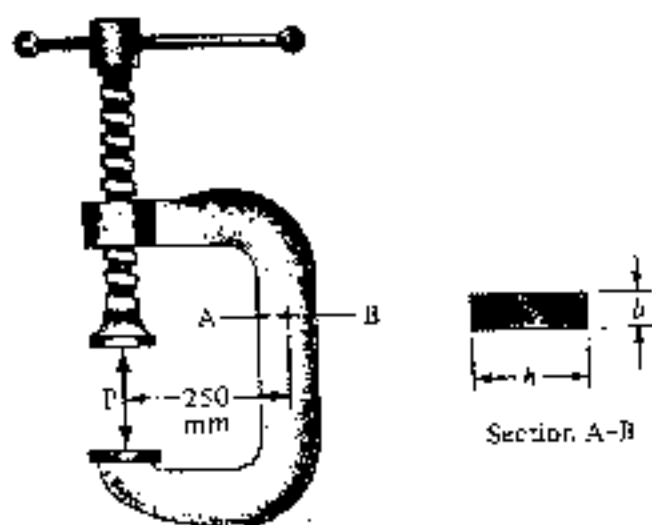


Fig. 2

3. The design specifications for the gear-and-shaft system, as shown in Fig. 3, require (i) that the same diameter be used for both shafts and (ii) that the rotating angle of pulley A be less than 7.5° . The pulley A is subjected to a $2 \text{ kip}\cdot\text{in}$ torque T_A while pulley D is held fixed. The radii of gears at B and C are 2 in and 5 in, respectively. Determine the required diameter of the shafts if both shafts are made of steel with $G = 11.2 \times 10^6 \text{ psi}$ and the allowable shearing stress $\tau_{all} = 8 \text{ ksi}$. (20%)

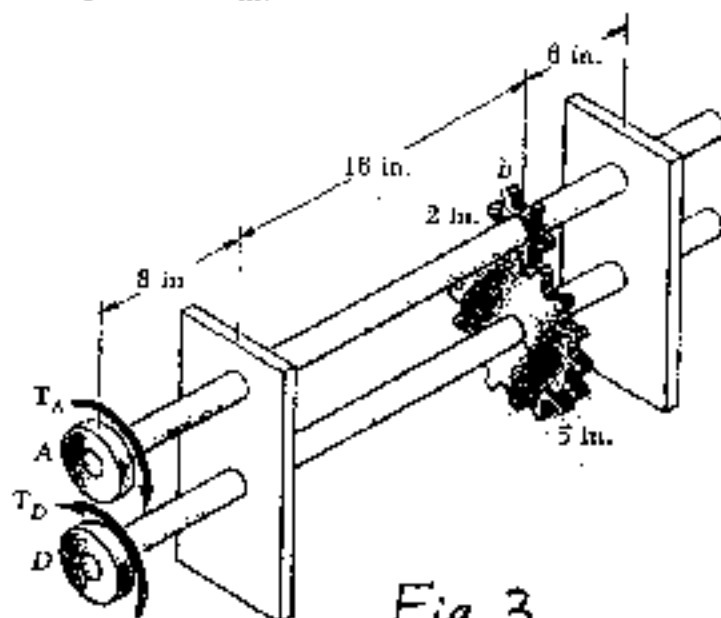


Fig. 3

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4. When the two torques, T_1 and T_2 , are applied to the steel ($E=200$ GPa and $G=80$ GPa) shaft of Fig. 4, point A rotates 3 mm in the direction indicated by torque T_1 . A strain gage bonded to the surface of the 50-mm shaft at angle of 45° with the axis of the shaft indicates a strain of 750μ . Determine
- the maximum tensile stress in the 50-mm shaft;
 - the magnitudes of the two torques;
 - the rotation of the right end of the 100-mm shaft with respect to its no-load position.

(20%)

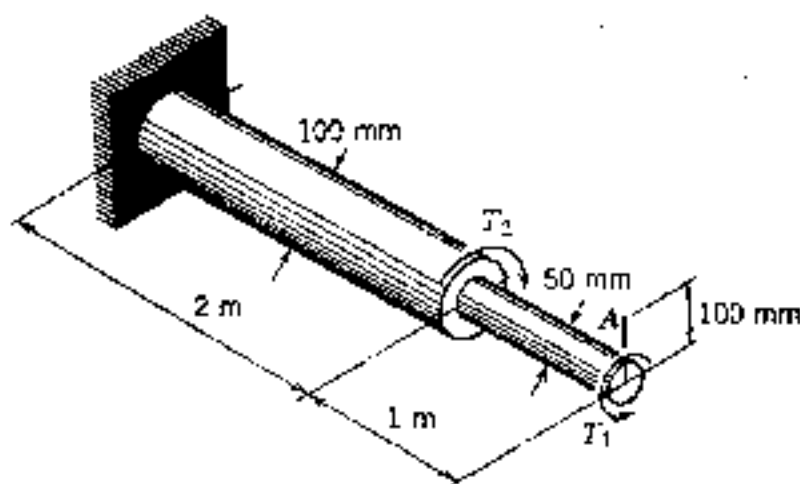


Fig. 4

5. A beam is loaded and supported as shown in Fig. 5. By using the energy method (Castigliano's theorem), determine
- the reactions at supports A and B in terms of w and L .
 - the deflection at C in terms of w , L , E (Young's modulus), and I (area moment of inertia).

(20%)

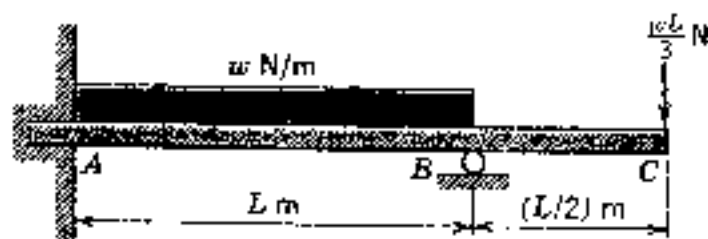


Fig. 5