

淡江大學九十三年學年度碩士班招生考試試題

系別：航空太空工程學系

科目：材 料 力 學

准帶項目請打「○」否則打「×」
簡單型計算機
○

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1. (30%) A 2-inch diameter 20-foot long bar is secured at the ends to support that permit a change in length of the bar of 0.06 inch. When the temperature is 80°F, there is no stress in the bar. For a temperature of -20°F and the following properties:
 modulus of elasticity = 10×10^6 psi,
 coefficient of thermal expansion = 13×10^{-6} (°F),
 Poission's ratio = 0.333, determine:
 (a) the maximum normal stress in the bar,
 (b) the maximum shearing stress in the bar, and
 (c) the change in the diameter of the bar.

 Note, it is given that $\delta_r = \alpha \Delta T L$

2. (20%) A 10-foot long solid circular steel shaft must resist a torque of 5,000 ft-lb without exceeding the allowable shearing stress of 10,000 psi or an angle of twist of 4.5 degrees. If the modulus of rigidity is 12 million psi, determine the minimum possible diameter of the shaft.

3. (15%) Explain the properties of the following mechanical elements,
 (a) rod, (b) bar, and (c) beam.

4. (10%) Describe the characteristics and the boundary conditions of the following beam structures,
 (a) cantilever beam, and (b) simple beam (simply supported beam).

5. (25%) At what distance "L" must a 200 lb weight be placed to cause the wooden board shown below to break if tensile strength of the wood is 2000 psi?

