4 1-4

淡江大學 102 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

考試日期：3 月 10 日(星期日) 第 3 節　　本試題共 **4** 大題，**2** 頁

1. A circular bar *AB* of length *L* is fixed at end *A* and free at *B* as shown in Figure 1. Three different loading conditions are to be considered:

(a) torque T_1 acting at end *B*; (b) torque T_1 acting at the midpoint *C*; and (c) torques T_1 acting simultaneously at *B* and *C*.

For **each case** of loading, determine the **strain energy *U*** stored in the bar. (25%)

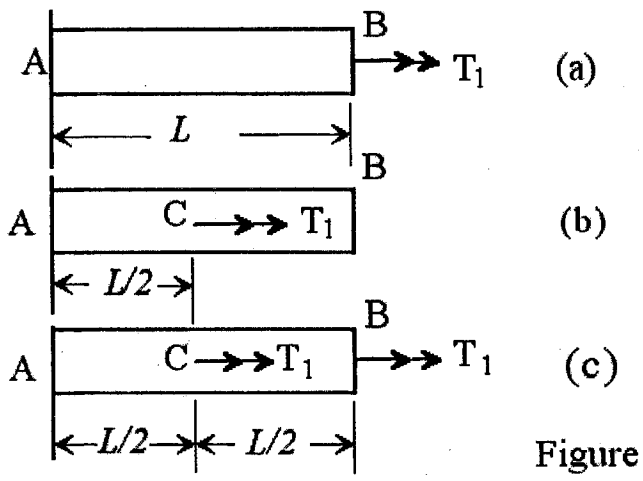

Figure 1.

2. A circular tube and a square tube as shown in *Figure* 2, are constructed of the same material. Both tubes have the same length, thickness, and cross-sectional area, and both are subjected to the same torque. What are the **ratios of the shear stresses** and of the **angles of twist** for the tubes? (Disregard the effects of stress concentrations at the corners of the square tube.) (25%)

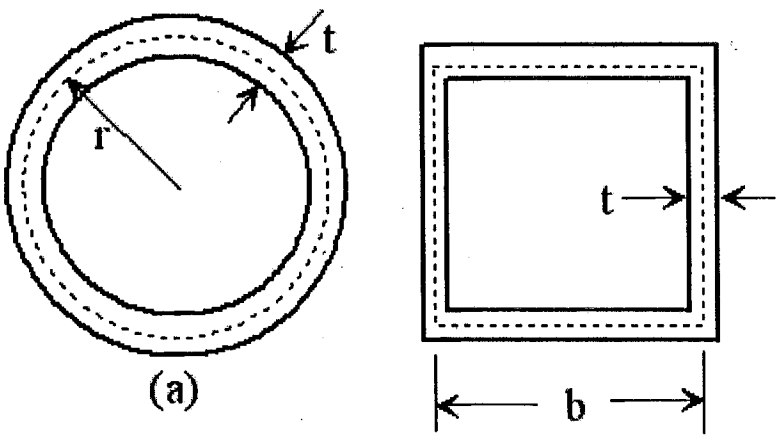

Figure 2.

背面尚有試題

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41-2

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3. Draw the Shear and moment diagrams for the beam as shown in Figure 3. (25%)

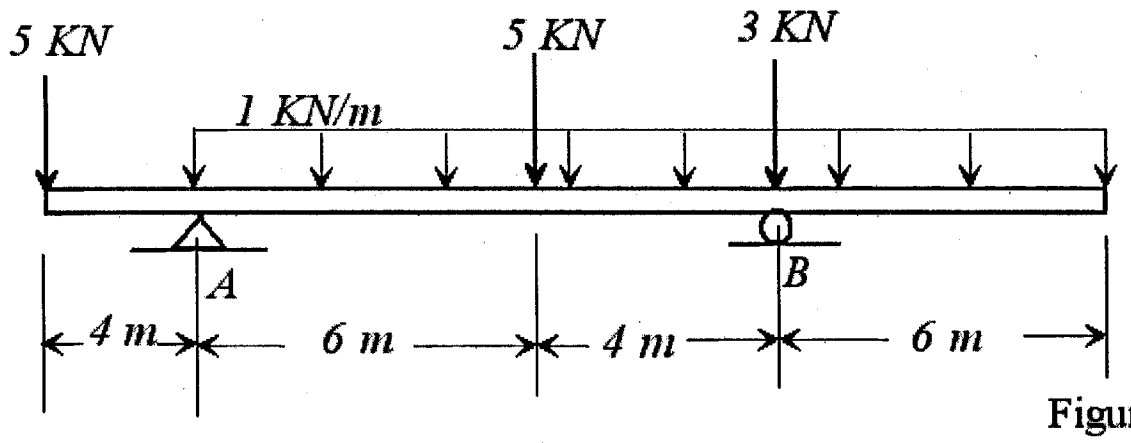

Figure 3.

4. A solid steel shaft of diameter *d=60 mm* and length *L=4 m* as shown in *Figure* 4 is to be designed using an allowable shear stress $\tau_{allow} = 40\ MPa$ and an allowable angle of twist per unit length, $\theta = 1^{\circ}$ per meter. (25%)

(a) Determine the maximum permissible torque $T_{\max}$ that may be applied to the shaft, assuming *G=80 GPa.*

(b) Determine the angle of twist ϕ.

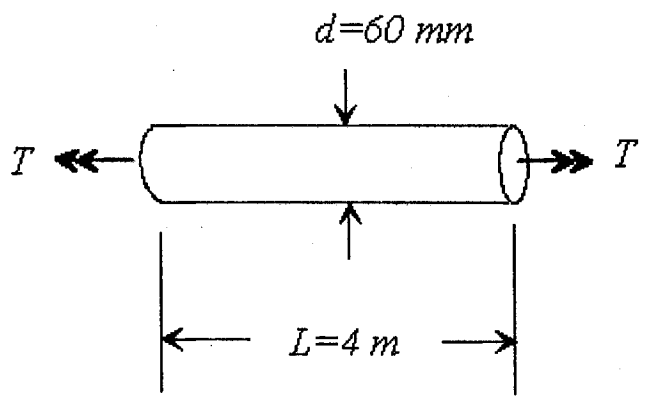

Figure 4