

國立中正大學  
111 學年度碩士班招生考試  
試題

[第 2 節]

|      |           |
|------|-----------|
| 科目名稱 | 材料力學      |
| 系所組別 | 機械工程學系-甲組 |

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

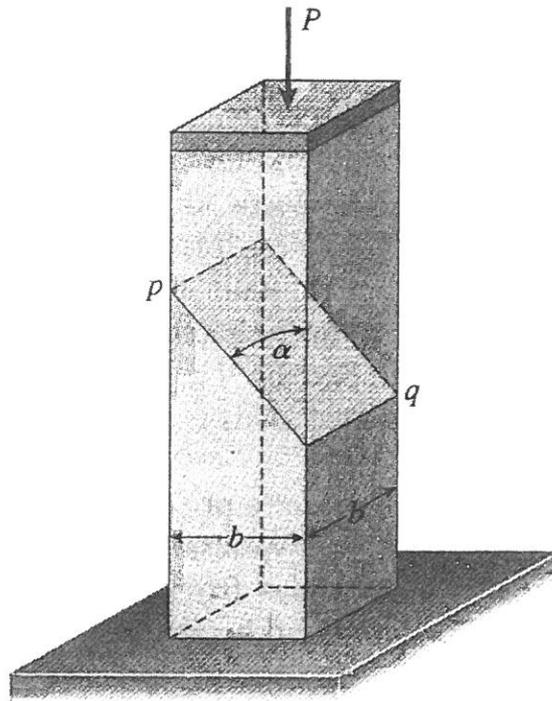
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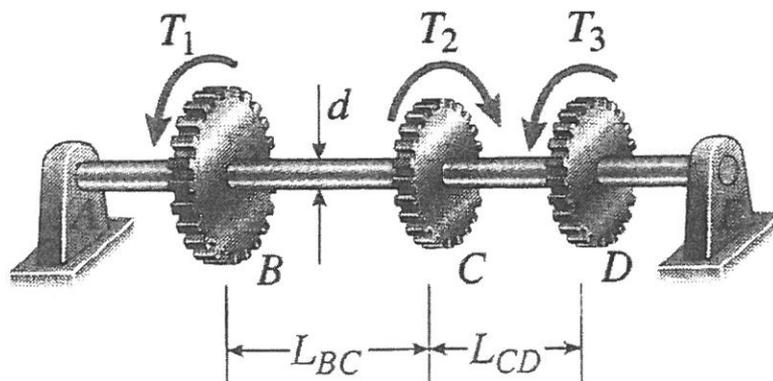
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系所組別：機械工程學系-甲組

1. A compression bar having a square cross section of width  $b$  must support a load  $P=8000lb$ . The bar is constructed from two pieces of material that are connected by a glued joint along plane  $pq$ , which is at an angle  $\alpha=40^\circ$  to the vertical. The material is a structural plastic for which the allowable stresses in the glued joint are 750 psi in compression and 500psi in shear. Determine the minimum width  $b$  of the bar. (25%)



2. A solid steel shaft  $ABCD$  having diameter  $d=30\text{mm}$  turns freely in bearing at points  $A$  and  $E$ . The shaft is driven by a gear at  $C$ , which applies a torque  $T_2=450\text{Nm}$  in direction shown in the figure. Gears at  $B$  and  $D$  are driven by the shaft and have resisting torques  $T_1=275\text{Nm}$  and  $T_3=175\text{Nm}$ , respectively, acting in the opposite direction to the torque  $T_2$ . Segments  $BC$  and  $CD$  have lengths  $L_{BC}=500\text{mm}$  and  $L_{CD}=400\text{mm}$ , respectively, and the shear modulus  $G=80\text{GPa}$ . Determine the maximum shear stress in each part of the shaft and the angle of twist between gear  $B$  and  $D$ . (25%)



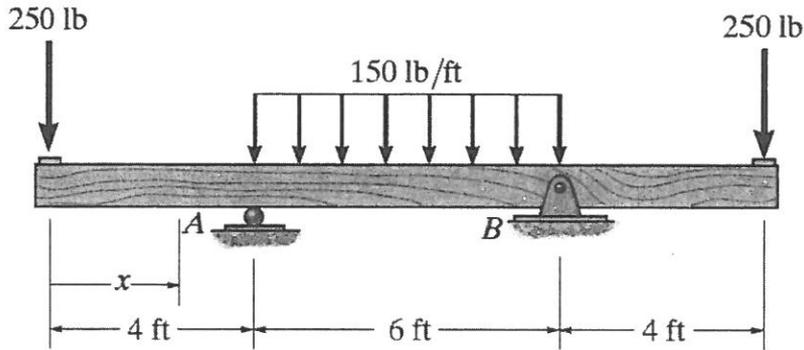
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3. Draw the shear and moment diagrams for the beam, and determine the shear and moment in the beam as functions of  $x$  for  $0 \leq x < 4 \text{ ft}$ ,  $4 \text{ ft} < x < 10 \text{ ft}$ ,  $10 \text{ ft} < x < 14 \text{ ft}$ . (25%)



4. Determine the equivalent state of stress on an element at the same point which represents (a) the principal stress, and (b) the maximum in-plane shear stress and the associated average normal stress. Also, for each case, determine the corresponding orientation of the element with respect to the element shown. Sketch the results on each element. (25%)

