

國立臺北科技大學

九十四學年度製造科技研究所入學考試

材料力學試題

填准考證號碼

第一頁 共一頁

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注意事項：

1. 本試題共 4 題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. A cantilever conical bar with unstressed length $L = 20 \text{ cm}$ is fixed horizontally as shown in Figure 1. A concentrated load, $P = 2 \text{ kN}$, is applied horizontally at the center of the free end of the conical bar. The end diameters of the bar are 4 cm and 1 cm respectively. The modulus of elasticity of the bar is 40 GPa . What will be the final length of this bar? (20%)
2. A thin-walled hollow tube of conical shape has its unstressed length $L = 20 \text{ cm}$ and constant thickness $t = 2 \text{ mm}$, and its average end diameters are 4 cm and 1 cm respectively, as shown in Figure 2. The shear modulus of elasticity of the tube is 15 GPa . (a) Determine the strain energy of the tube when it is subjected to pure torsion by torques $T = 100 \text{ N}$. (20%) (b) Determine the angle of twist. (20%)
3. Calculate an approximate value of the critical buckling load P_{cr} for an ideal column with simple supports having two different moments of inertia, as shown in Figure 3. Use a trigonometric shape function with one displacement parameter, as follows: $v = \delta \sin\left(\frac{\pi x}{L}\right)$. (20%)
4. Obtain the equations for the deflection v for the left-hand half of the simple beam, as shown in Figure 4. (20%)

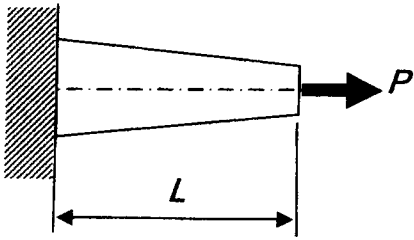


Figure 1

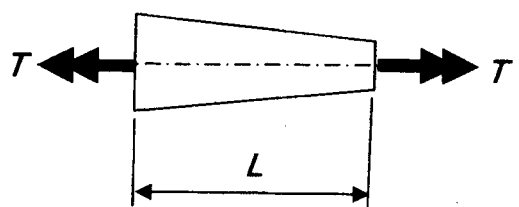


Figure 2

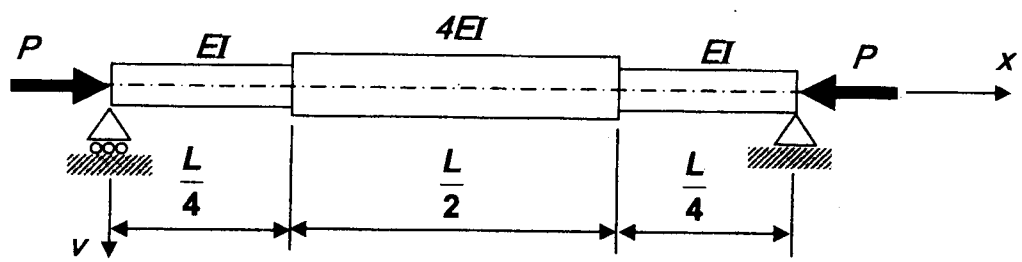


Figure 3

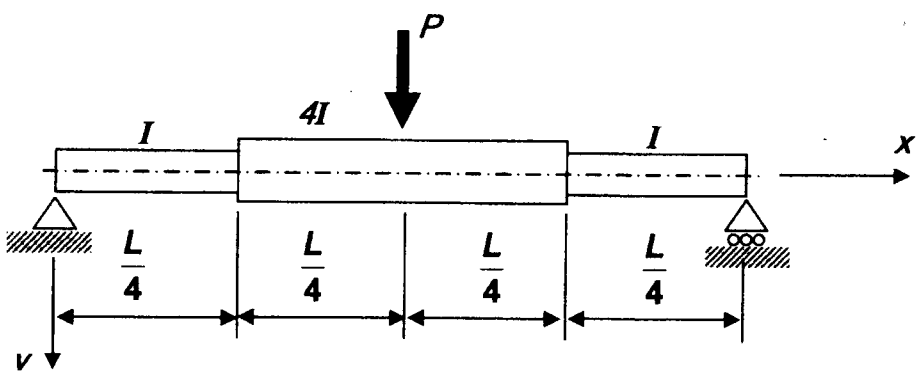


Figure 4