

國立臺北科技大學 100 學年度碩士班招生考試

系所組別：3110 土木與防災研究所甲組

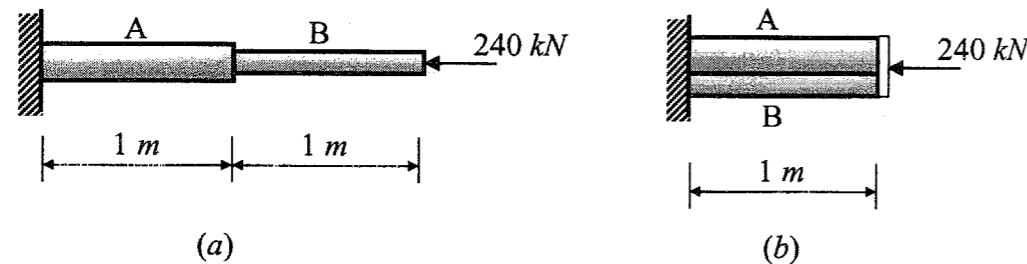
第一節 材料力學 試題

第一頁 共一頁

注意事項：

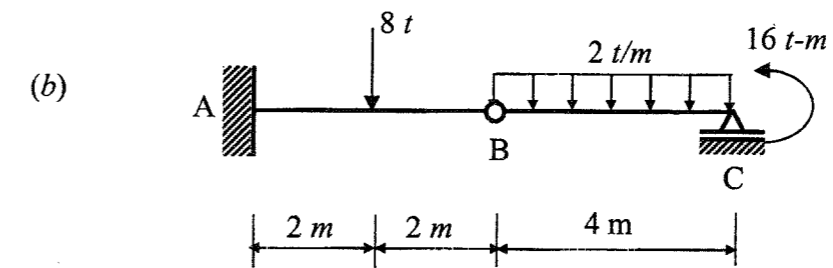
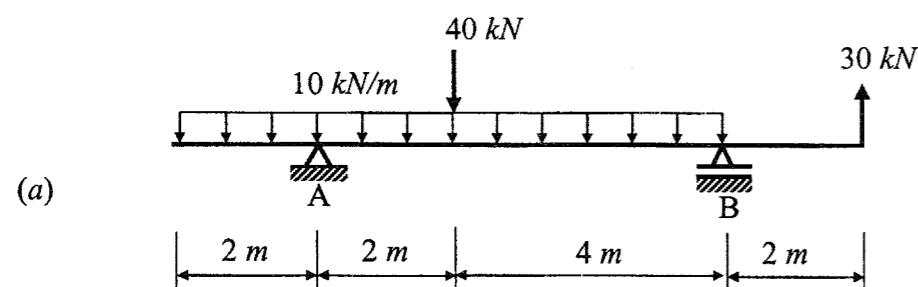
1. 本試題共 5 題，每題 20 分，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

- (1) Two prismatic bars A and B with the same length 1 m , are made from different materials. The cross sectional areas for A and B are 12 and 8 cm^2 , while their modulus of elasticity are 100 and 150 GPa , respectively. The two bars are now connected in different ways and under a 240 kN load as shown in below. Please determine the axial stresses (MPa) in bars A and B, and the total shortening (mm) for both cases.

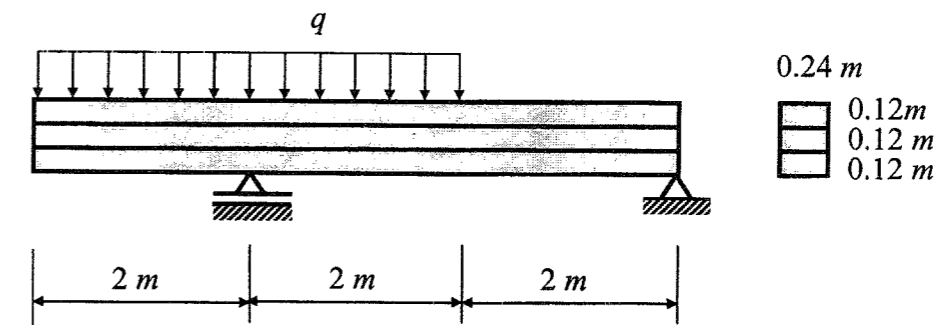


- (2) A homogeneous steel rail has an allowable tension stress 2400 kgf/cm^2 , and allowable compression stress 1500 kgf/cm^2 . Its modulus of elasticity is $2.0 \times 10^6\text{ kgf/cm}^2$, and the coefficient of thermal expansion is $15 \times 10^{-6}/^\circ\text{C}$. Assume that the temperature was 25°C during the rail was fixed onto the pre-stressed sleepers, please find the range of allowable temperature.

- (3) Please draw the shear and moment diagrams for the following systems.



- (4) An extended simple beam is made by wood bonded in three layers as shown in below. The allowable flexural stress and shear stress of the wood are $\sigma_{\text{allowable}} = 1 \times 10^7\text{ N/m}^2$, and $\tau_{\text{allowable}} = 5 \times 10^5\text{ N/m}^2$, respectively. The allowable shear stress of the adhesive face is $\tau_{\text{allowable}} = 3 \times 10^5\text{ N/m}^2$. Please find the maximum possible uniform load q (kN/m).



- (5) A uniform cantilever with constant flexural rigidity EI and loaded at the free end by a concentrated load P and a bending moment kPL as shown in below. If considering only the effect of bending, what would be the value of k when the deflection at the center point of the beam is zero.

