

國立嘉義大學九十六學年度

土木與水資源工程學系碩士班招生考試（甲組）試題

科目：工程力學

（如有條件不足之情形，請自行假設。 僅可使用學校提供之計算機）

1. A loading crane consisting of a steel girder ABC supported by a cable BD is subjected to a load P. The cable has an effective cross-sectional area $A=240\text{mm}^2$. The dimensions of the crane are $H=1.5\text{m}$, $L_1=3.0\text{m}$ and $L_2=1.5\text{m}$.
 - (1) If the load $P=28\text{kN}$, what is the average tensile stress in the cable? (15%)
 - (2) If the cable stretches by 4.0 mm, what is the average strain? (5%)

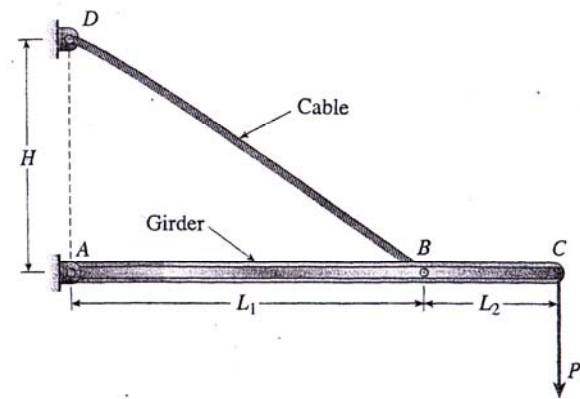


Fig-1

2. Prior to applying the distributed load to the cantilever beam shown in Fig-2, a gap Δ exists between its free end and a roller. Assuming that q is large enough to close the gap, calculate that the roller reaction. (given by the function of q and Δ) (20%)

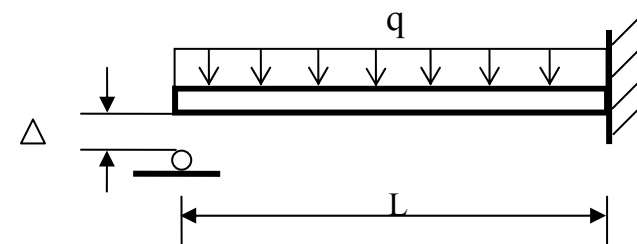


Fig-2

3. A weight W is attached to the lower end of a vertical steel cable that is moving down ward with constant velocity V as shown Fig-3. What maximum stress is produced in the cable when its upper end is suddenly stopped? (Neglect the weight of the cable itself.) (20%)

EA: the axial rigidity of the cable
 L : the length of the cable
 g : acceleration of gravity

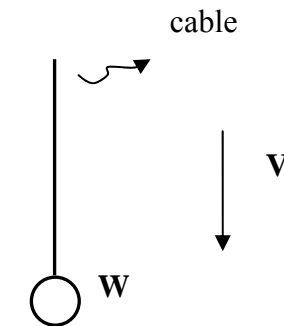


Fig-3

4. The cantilever beam shown in the Fig-4 supports a concentrated load and a segment of uniform load. Draw the shear-force and bending-moment diagrams for this cantilever beam. (20%)

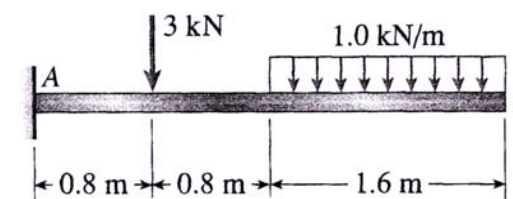


Fig-4

5. An element in plane stress is subjected to the stresses $\sigma_x=1500\text{ MPa}$, $\sigma_y=500\text{ MPa}$, and $\tau_{xy} = 400\text{ MPa}$ as shown in Fig-5,
 - (1) Determine the stresses on an element inclined at an angle $\theta =45^\circ$. (7%)
 - (2) Determine the principal stresses and angles. (7%)
 - (3) Determine the maximum shear stresses and angle. (6%)

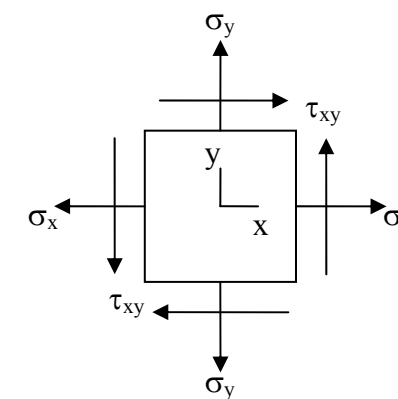


Fig-5