國立臺北科技大學 112 學年度碩士班招生考試

系所組別：3110 土木工程系土木與防災碩士班甲組

第一節　材料力學　試題

第 1 頁　共 1 頁

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注意事項：

1. 本試題共 3 題，共 100 分。
2. 不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

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1. A wood beam AB on simple supports with span length equal to 3 m is subjected to a uniform load of intensity 2 kN/m, a concentrated load of 30 kN acting at a point C, and a moment at A of 26 kN-m (see figure).

   a. Draw the shear-force and bending-moment diagrams for this beam. (20%)

   b. Determine the normal stress σ_C and shear stress τ_C at a point just left of C, which is located <u>200 mm below the top of the beam</u>. (20%)
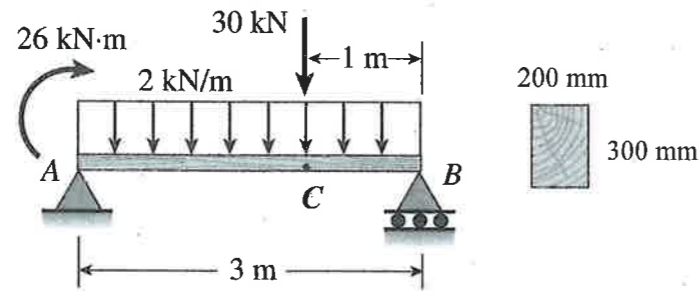
2. A bar ABC having two different cross-sectional areas A_1 and A_2 and a modulus of elasticity E is held between rigid supports A and B. A load P acts at point C, which is distance a from end A and distance b from end B.

   a. Obtain formulas for the reactions R_A and R_B at supports A and B. (15%)

   b. Determine the displacement δ_C at point C. (15%)
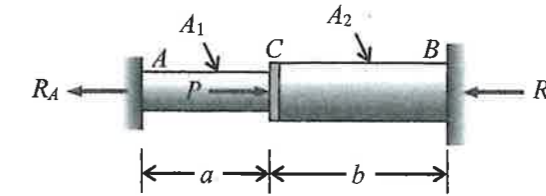
3. An element in plane stress is subjected to stresses shown in the figure below. (<u>Please pay attention to the directions of these stresses.</u>)
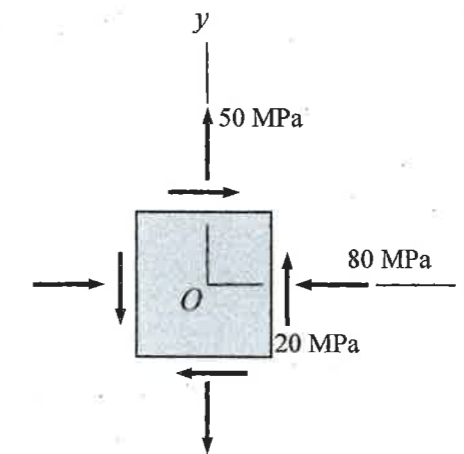
   a. Determine the stresses σ_{x1} and τ_{x1y1} acting on the element when the x_1 axis is oriented at an angle $\theta = 30°$ <u>counterclockwise</u> from the x axis. (10%)

   b. Calculate the principal stresses σ_1, σ_2, and principal angle θ_{p1}. Show them on a sketch of a properly oriented element. (10%)

   c. Calculate the maximum shear stresses τ_{max} and the associated normal stresses and angle θ_{s1}. Also show them on a sketch of a properly oriented element. (10%)