

國立彰化師範大學 98 學年度碩士班招生考試試題

系所：機電工程學系

組別：甲組

科目：(乙)材料力學

☆☆請在答案紙上作答☆☆

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#1. If the working plane is the x - y plane, find the transformation equations for plane stress. The in-plane stresses are expressed by σ_x , σ_y , and τ_{xy} , where σ_x and σ_y are the normal stresses in x and y directions, respectively; τ_{xy} is the shear stress acting on the x - y plane. (25%)

Note: you have to draw the corresponding plots, such as stress element diagram, the angle of inclined plane and etc., to derive your solutions. Low grade will be given if the variables shown on your answer sheet are not explicitly defined.

#2. Based on problem 1, determine the in-plane principal stresses and the in-plane maximum shear stresses. What is the relationship between the principal planes and the planes of maximum shear stress? (25%)

Note: High grade will be given only if the required procedures of derivation are shown on your answer sheet.

#3. Considering an isotropic material, if a point of the material is subjected to plane stresses, the working plane being the x - y plane, find all the strains by employing linear Hook's law. Assume that E , G and ν are, respectively, the Young's modulus, the shear modulus and the Poisson's ratio. (25%)

#4. Considering a cantilever beam with uniform cross section, where A is the area of the cross section and I is the moment of inertia that you need. If the beam is subjected to a tensile load P acting at distance e from its axial axis, where the axial axis is defined as the axis passes through the centroids of the cross sections, find all possible locations of neutral axis and give the reason. (25%)

Note: there are three possible locations. For convenience, you can just draw three corresponding plots to show them.