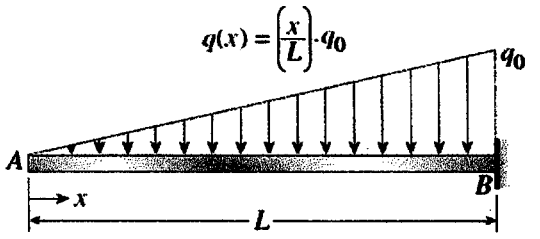
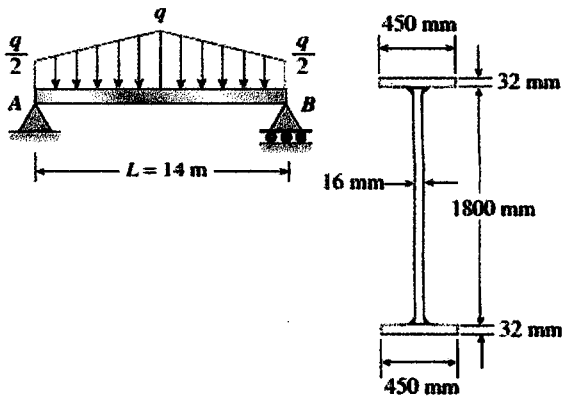
Question 1 (25%)

A cantilever beam *AB* is subjected to a linearly increasing load:
(a) Derive the equations of shear force V(x) and bending moment M(x) of this beam. (10%)
(b) Plot shear force and bending moment diagrams of this beam and clearly mark the maximum and minimum values and their locations. (15%)



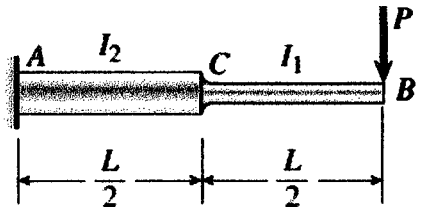
Question 2 (25%)

A bridge girder *AB* on a simple span of length L = 14 m supports a distributed load of maximum intensity q at mid-span and minimum intensity $q/2$ at supports *A* and *B* that includes the weight of the girder. The girder is made of a steel beam of wide-flange shape.
(a) Calculate the load q based upon the yield stress of the steel material σ_y = 110 MPa. (10%)
(b) Calculate the load q based upon the shear strength of the steel material τ = 50 MPa. (10%)
(c) Design the maximum allowable load that this beam can bear based on the load q determined in (a) and (b). Assume the factor of safety is FS = 2. (5%)



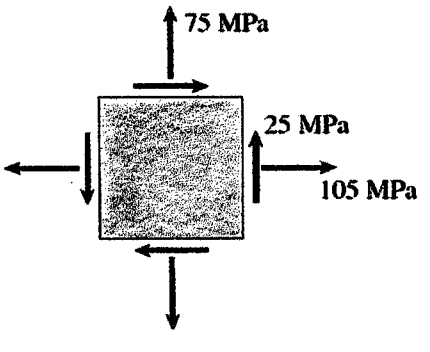
Question 3 (25%)

The cantilever beam *ACB* has moments of inertia I_2 and I_1 in parts *AC* and *CB*, respectively. Determine the deflection δ_B at the free end due to the load *P*.



Question 4 (25%)

An element is under plane stress conditions subjected to σ_x =105 MPa, σ_y =75 MPa, and τ_{xy} = 25 MPa.
(a) Discuss what is the purpose of doing stress transformation. (5%)
(b)Determine the principal stresses and the orientation of the principal planes. Show them on a sketch of a properly oriented element. (10%)
(c) Determine the maximum shear stresses and the orientation of the planes corresponding to the maximum shear stresses. Show them on a sketch of a properly oriented element. (10%)



試題隨卷繳回