國立臺灣海洋大學一００學年度研究所碩士班暨碩士在職專班入學考試試題

考試科目： 材料力學

系所名稱： 機械與機電工程學系碩士班微系統A組(聯)、機械與機電工程學系碩士班固力組(聯)

1.答案以橫式由左至右書寫。2.請依題號順序作答。

Note: 所有問題均須依據學理詳細作答。若需圖形輔助，請清楚繪製。

1 (1) What is the "Mechanics of Materials"? (2) What are the major differences between "Mechanics of Materials" and other disciplines of solid mechanics (for example, Statics, Elasticity,)? (3) Besides Statics, Dynamics, and elementary Mechanics of Materials, Have you studied other courses related to solid mechanics? What topics are given in these courses? (10 分)

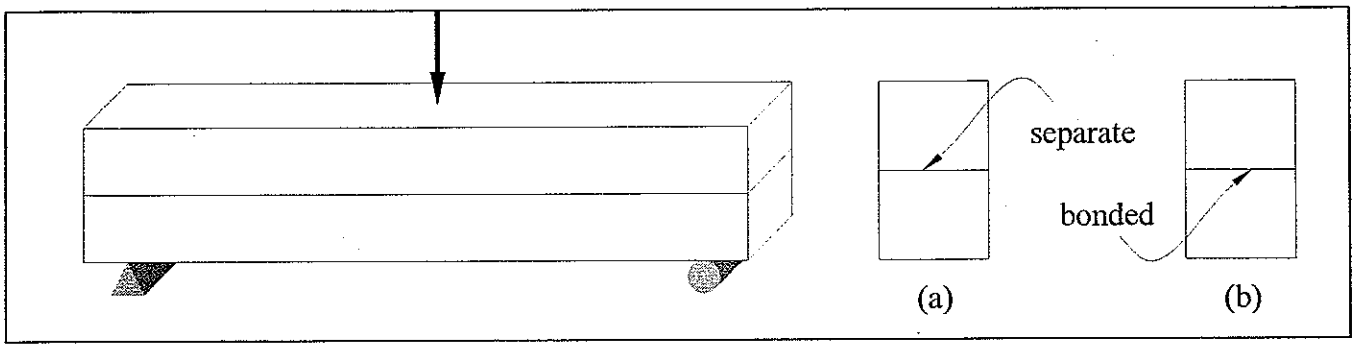
2 Consider an isotropic materials with Young's modulus E and Poisson's ratio ν. (1) Write the strain-stress relations for the material under a general stress state. (2) Write the stress-strain relations for simple stress state. (3) Write the stress-strain relations for plane stress state (10 分)

3 Consider the elementary beam theory (or called Classical Beam Theory). (1) What are the assumptions of this theory? (2) Derive the relation between flexural angle (θ) and deflection (v). (3) Derive the relation between curvature (κ) and deflection (v). (4) Derive the relation between strain (ε) and curvature (κ). (5) Derive the relation between curvature (κ) and moment (M). (6) Derive the relation between stress (σ) and moment (M). (7) Let q, V, M be the loading (per unit length), shear force and moment. Derive the equilibrium equations. (25 分)

4 Give an example to illustrate the unsymmetrical bending and show how to avoid the unsymmetrical bending (10 分)

5 Why it is important to locate the shear center (or called flexural center) in the design of thin-walled structures? Give an example to illustrate how to locate the shear center. (10 分)

6 考慮組合梁受力如下圖所示，上、下梁的材質及尺寸均相同。考慮兩種組合情形：(1)上、下梁未結合，接觸面沒有摩擦力，如圖(a)所示。(2)上、下梁完美結合，接觸面沒有滑動，如圖(b)所示。計算這兩支組合梁最大撓度的比值及最大應力的比值。(10 分)



7 Consider a 90° circular beam with bending rigidity EI. The supporting and loading conditions of the beam are shown in the figure. Use energy method to determine the reaction and displacement at position A. (Neglect the effects of axial and shear deformation) (25 分)