國立成功大學

112學年度碩士班招生考試試題

編　號：104

系　所：土木工程學系

科　目：材料力學

日　期：0206

節　次：第 1 節

備　註：可使用計算機

編號： 104

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※ 考生請注意：本試題可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. The normal stress on the rectangular cross-section varies linearly for the position (y, z) in the cross-section. That is, σ_x has the form $\sigma_x = a + by + cz$. The values of σ_x at corners A (1, -4, 2), B (1, 4, 2), and C (1, 4, -2) are $\sigma_{xA} = 12$ MPa, $\sigma_{xB} = 8$ MPa, and $\sigma_{xC} = 12$ MPa, respectively. Determine the bending moment M_y. (25%)

2. The prismatic axial rod AC of 3-m long is made of linearly EPP (elastic-perfectly-plastic) material with $\sigma_y = 250$ MPa and $E = 200$ GPa. The bar has a constant cross-sectional area of $A = 500$ mm^2. There is a 1 mm gap between the right end, C, and the adjacent rigid wall. One contracted point load P is horizontally acting along the longitudinal direction of the bar at B, 2 m from the left fixed end, A. Sketch an axial load P versus axial displacement δ diagram and mark three sets of values (δ, P) at the gap-closing, yielding, and plastic case, respectively. (25%)

3. If the EPP model is applied for the plastic design of the beam, determine the ratio of shape factor (f_c/f_s) between a beam with circular section, f_c and square section, f_s, respectively. The height of the square section is as same as the circular section. (25%)

4. A mass m is dropped from height h, impacting one uniform cantilever beam AC at point B, at a distance βL from the cantilevered end, A. Determine an expression that relates the maximum tip deflection. $\delta_{c,\max}$, to the drop height h and location and to other parameters: m, E, I, β, and L. (25%)