編號： 109

國立成功大學 105 學年度碩士班招生考試試題

系　　所：土木工程學系

考試科目：結構學

考試日期：0227，節次：2

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

1. A truss structure is shown below. By using the unit-force method (as known as virtual work method), prove that the vertical deflection Δ_2 at point 2 in Figure 1(a) is equal to the vertical deflection Δ_1 at point 1 in Figure 1(b). (20%)

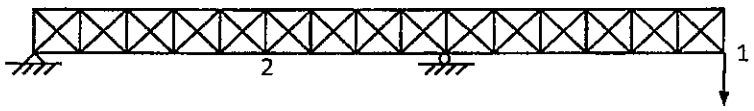

Figure 1(a)

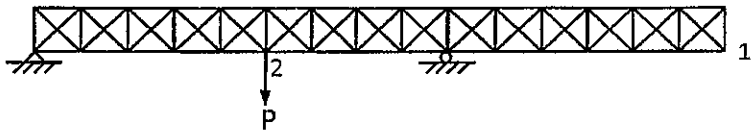

Figure 1(b)

2. Consider a cantilever beam AB with a vertical load *P* and a moment *M* applied at point B. Using the conjugate beam method, compute the load *P* and moment *M* such that the vertical deflection Δ_B and slope θ_B at point B satisfy the following conditions $\Delta_B = -\Delta$ (i.e., Δ_B is pointed downward) and $\theta_B = 0$. Express *P* and *M* in terms of Δ, respectively. Assume the bending rigidity *EI* of the beam is constant. (20%)

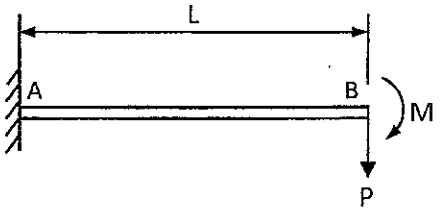

Figure 2

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3. A beam ABC with two tie rods is shown below. (1) Using the method of consistent deformation, compute the tensions in the rods DB and DC. (2) Plot the shear and moment diagrams for the beam. Assume that the bending rigidity for the beam is EI = 1 kN-m^2 and axial rigidity for the both rods is AE = 1 kN. Neglect the axial deformation of the beam. (30%)

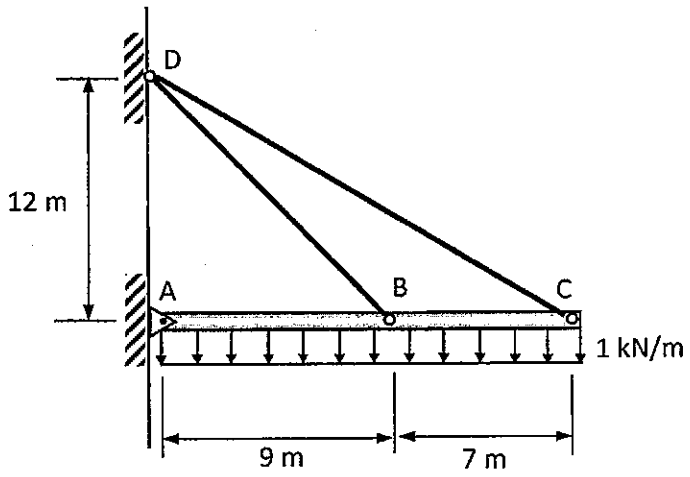

Figure 3

4. As shown below, a frame with a spring is subjected to a horizontal load 100 kN. Assume EI for all members is constant and the spring constant is $k = (10/9)EI$. The spring is un-stretched without the load. (1) Using the slope-deflection method, compute the shears and moments at point C and point D, respectively. (2) Plot the complete moment diagram for the frame. Plot the positive moment on the compression side of the member. (30%)

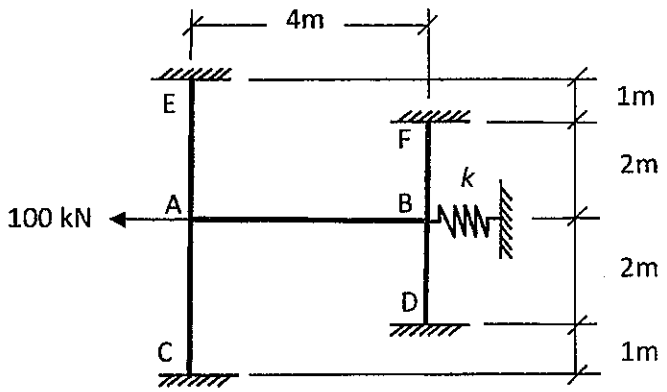

Figure 4