※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

(1) Consider a beam structure as shown in Figure 1 where point B is an interior hinge. Construct the influence lines for the vertical reaction at A (R_A), the vertical reaction at C (R_C) and moment at C (M_C) of the beam. (25%)

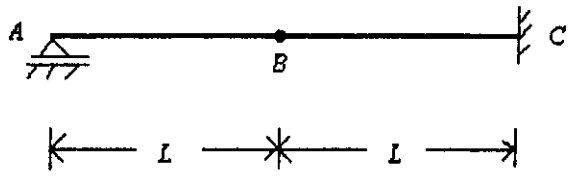

Figure 1

(2) Consider a beam structure as shown in Figure 1.

(a) Determine the relative rotation between the left hand side and the right hand side of point B caused by a unit load acted at B (i.e., $\Delta\theta_B$) (see Figure 2a). (10%)

(b) Determine the deflection of point B caused by a pair of unit moment acted at B (i.e., δ_B) (see Figure 2b). (10%)

(c) Is $\Delta\theta_B$ identical to δ_B ? If yes, what theorem or law is related to this results ? (5%)

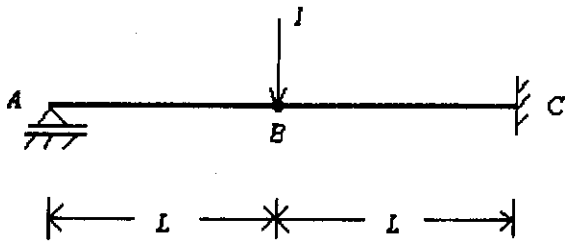

Figure 2a

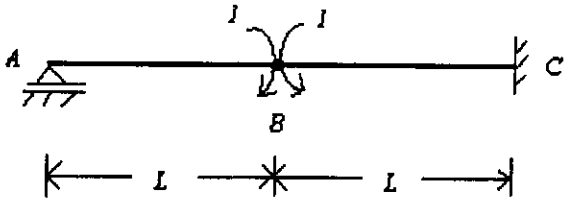

Figure 2b

(背面仍有題目,請繼續作答)

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(3) Consider a plane frame as shown in Figure 3 where joint C is connected with a axial spring of which spring stiffness is k_s ($k_s = \frac{12EI}{L^2}$) and a moment of magnitude M_0 is applied at B.

(a) Determine the sidesway of the frame (Δ) and the rotations of points B and C (i.e., θ_B, θ_C) using the slope-deflection method. (20%)

(b) Briefly draw the deformation curve of this loaded frame. (5%)

EI=constant for each member.

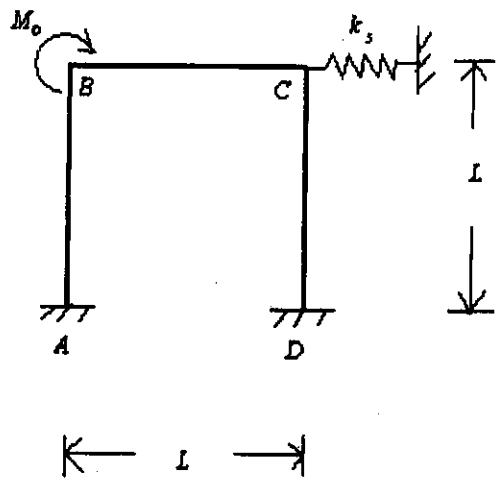

Figure 3

(4) Consider a truss structure as shown in Figure 4 where the length of each member is L and AE=constant for each member. Determine the horizontal displacements at points B and C (i.e., $(\delta_h)_B$ and $(\delta_h)_C$) using the matrix displacement method. (25%)

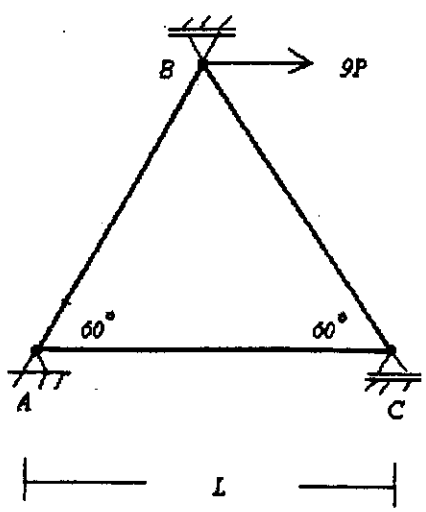

Figure 4