系所組別：土木工程學系甲、丁組

考試科目：結構學 考試日期：0219，節次：2

※ 考生請注意：本試題可使用計算機

(1) Draw the influence line for the internal force in member *FG* of the bridge truss when a unit load is moving on the floors 0–6. (25%)

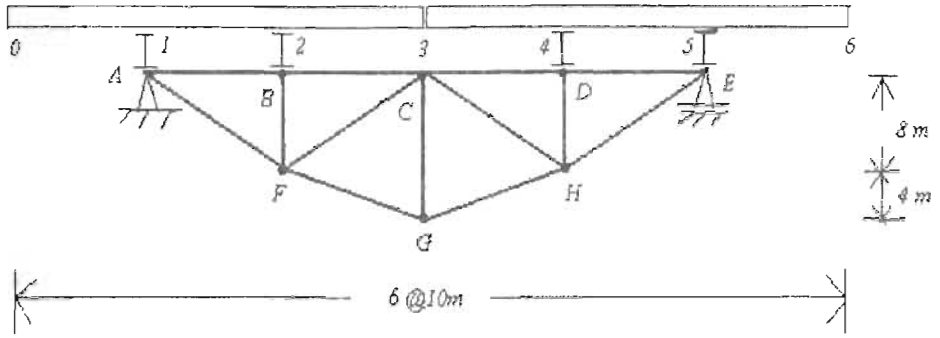

Fig. 1

(2) Consider a loaded statically determinate beam as shown in Fig. 2 (*EI*=constant). The support *a* is a guide support, which means the rotation of point *a* is zero, and point *a* can freely move in the vertical direction (i.e., $\theta_a = 0$ and $\Delta_a \neq 0$). The joint *b* is a center hinge placed on a roller support.

Determine the relative rotation at point *b*, which is $\Delta\theta_b$, and $\Delta\theta_b = \theta_{b^+} - \theta_{b^-}$, in which θ_{b^+} and θ_{b^-} denote the rotations at points b^+ and b^-, respectively,

(a) using the conjugate-beam method, (13%)

(b) using the unit-load method (i.e., the virtual work method). (12%)

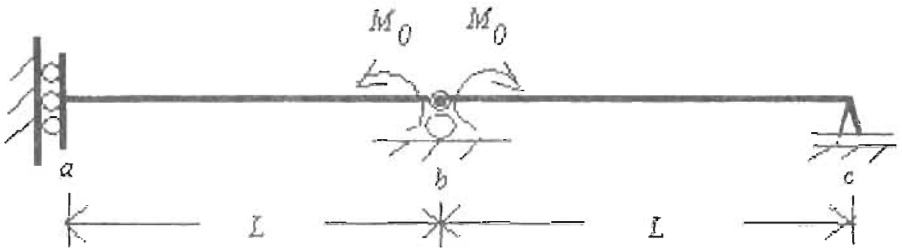

Fig. 2

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(3) Consider a plane frame as shown in Fig. 3 (EI=constant), in which the joint C is a roller support and connected with an axial spring, of which the spring stiffness is k_s ($k_s = \frac{6EI}{L^3}$), and a moment of magnitude M_0 is applied at B. Determine the displacement of point C (Δ_C),
(a) using the slope-deflection method, (13%)
(b) using the moment-distribution method. (12%)

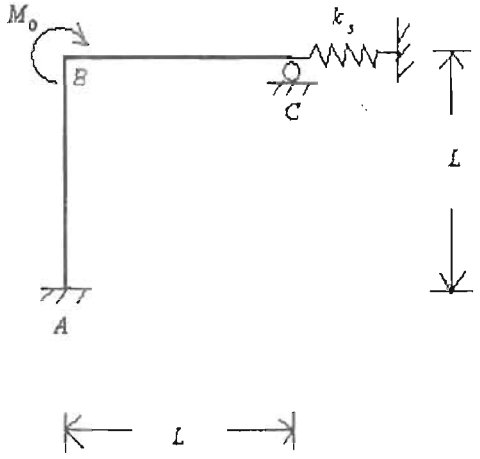

Fig. 3

(4) Consider a truss structure as shown in Fig 4a, in which the length and axial rigidity of each member is L and AE, respectively, k_s denotes the spring coefficient ($k_s = AE/L$), and the numberings of the joints and members are shown in Fig 4b. Determine the horizontal and verticle displacements at point C (i.e., $(\Delta_C)_h$ and $(\Delta_C)_v$) using the matrix displacement method. It is noted that a standard solution procedure of this method is required. (25%)

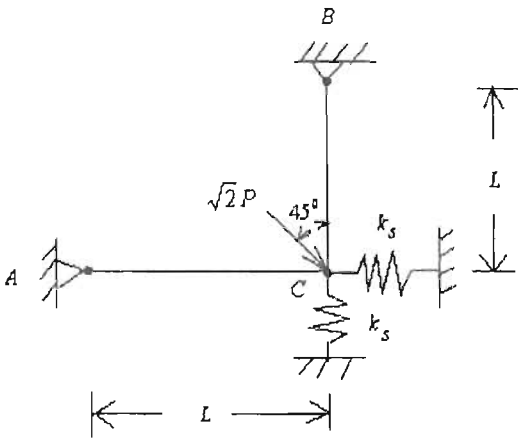

Fig. 4a

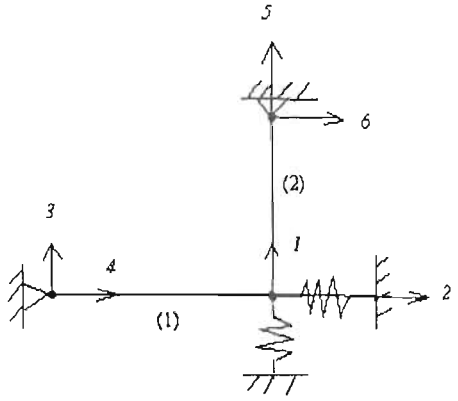

Fig. 4b