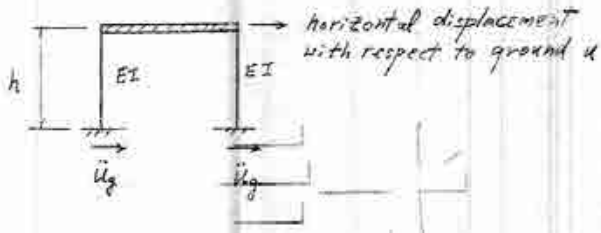
考生注意: 1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分，並限以藍黑色筆作答。
3. 試題隨卷繳回。(餘請詳閱試場規則)

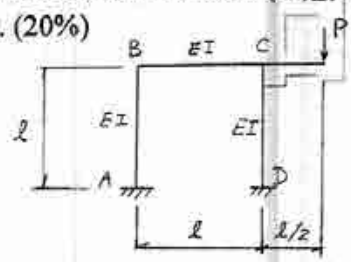
(1) Derive the stiffness matrix for a flexural element, assuming the length of the element is L and its flexural rigidity is EI. The generalized displacement vector and the generalized force vector are illustrated as follows. (15%)

The generalized displacement vector $\mathbf{D}=\begin{Bmatrix} u_1 \\ \theta_1 \\ u_2 \\ \theta_2 \end{Bmatrix}$, the generalized force vector $\mathbf{F}=\begin{Bmatrix} V_1 \\ M_1 \\ V_2 \\ M_2 \end{Bmatrix}$

(2) Derive the equation of motion of the one-story shear building subjected to a horizontal ground acceleration $\ddot{u}_g$, assuming the lumped mass is m and the damping coefficient is c. (15%)



(3) Determine the member end moments (M_{AB}, M_{BA}, M_{BC}, M_{CB}, M_{CD}, M_{DC}) of the rigid frame as shown. (20%)



(4) Draw the influence lines for (a) the vertical reaction at C, and (b) the vertical reaction at D. According to the influence line in (b), determine the general expressions for the reactions at D (c) when a uniform loading w is applied to section CD of the beam, and (d) when a triangular loading with a maximum w is applied to section CD of the beam as shown in Fig. 1. (25%)

(5) The following structure is a girder, which is supported by a cable, with an internal beam at some intermediate point along its length. (a) Please explicate why the structure is statically determinate. (b) Design as you wish a problem with the same type of structure and find the reaction of the girder and the tension of the cable. (25%)