C 6122 (Pages 3) Name.....

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, JUNE 2010

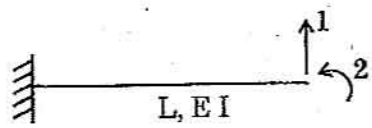
CE 04 602—STRUCTURAL MECHANICS—III

(2004 Admissions)

Time : Three Hours Maximum : 100 Marks

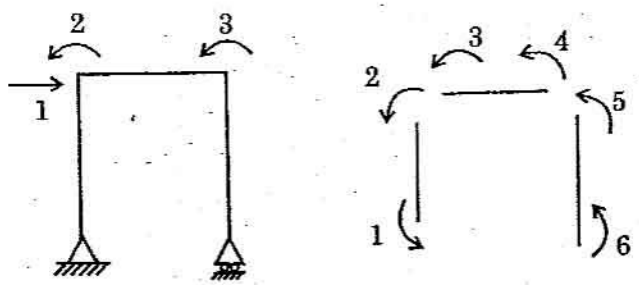
Missing data, if any, may be suitably assumed.
Answer **all** *questions.*

I. (a) Define the flexibility matrix and stiffness matrix for the following beam.



(b) Prove that $[K] = [B]^T [K] [B]$. Symbols have their usual meanings.

(c) Derive the load transformation matrix for the following frame with element coordinate as shown.



(d) Derive the stiffness matrix for a 20 bar element in terms of 1D bar element.

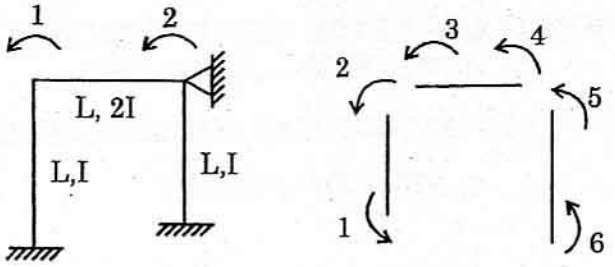
(e) Discuss the damped free vibration of an SDOF system with different levels of damping.

(f) Explain the principle of vibration isolation.

(g) Prove that stiffness matrix is symmetric.

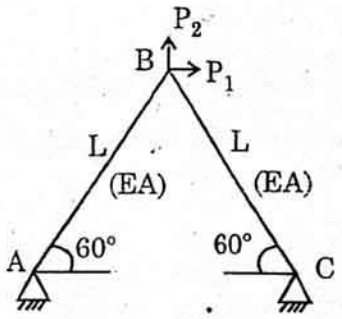
Turn over

(h) Derive the displacement transformation matrix for the following frame :—



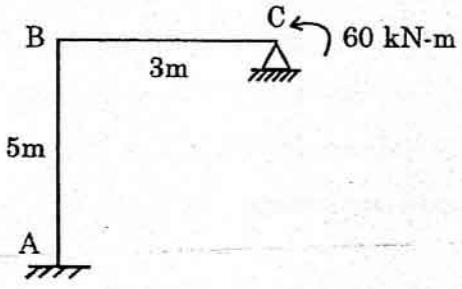
(8 × 5 = 40 marks)

II. (a) Considering only axial deformations for the truss shown, determine the flexibility matrix [F] associated with the applied forces P_1 and P_2.

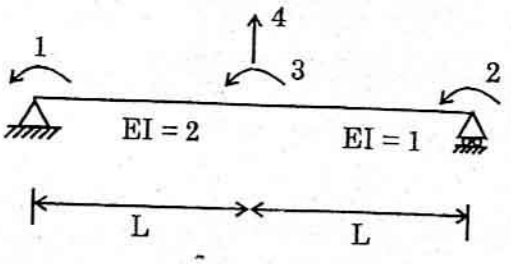


Or

(b) Analyse the following frame for displacement and member forces. Use flexibility method. EI = constant.

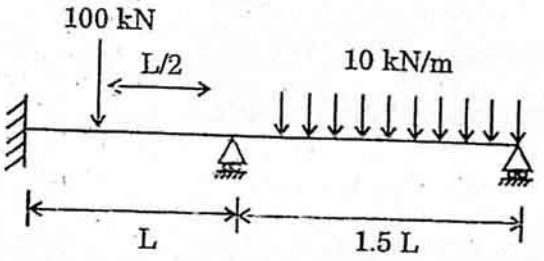


III. (a) Generate the stiffness matrix for the following beam with co-ordinates as shown.



Or

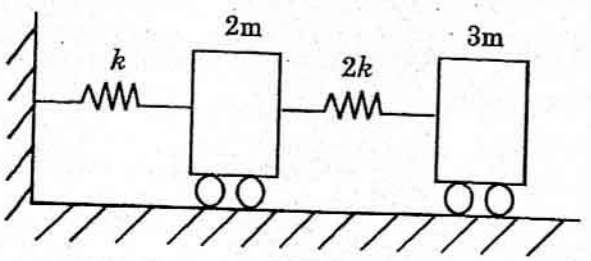
(b) Find the displacements over supports and member end forces for the beam shown below. Use stiffness approach. (L = 4m).



IV. (a) A single degree of freedom system (under damped) is subjected to a sinusoidal base displacement. Find the expression for displacement transmissibility.

Or

(b) Find the frequency of vibration and mode shapes for the following 2 DOF system.



(3 × 20 = 60 marks)