Code : 011511

B.Tech. 5th Semester Exam., 2013

STRUCTURAL ANALYSIS—I

Time : 3 hours   **akubihar.com**   Full Marks : 70

Instructions :
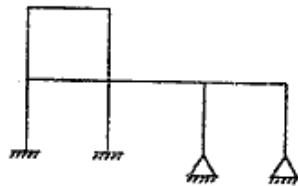
(i) *All questions carry equal marks.*

(ii) *There are* **NINE** *questions in this paper.*

(iii) *Attempt* **FIVE** *questions in all.*

(iv) *Question No.* **1** *is compulsory.*

1. Answer/Choose the correct one (any *seven*) :

   (a) The degree of statical indeterminacy of a propped cantilever is

     (i) zero

     (ii) 1

     (iii) 2

     (iv) 3

   (b) Find the degree of statical indeterminacy of the following structure :

(2)

(c) A pin-jointed truss cannot deflect unless

  (i) there is load on it

  (ii) the members are stressed

  (iii) there is change in lengths of members

  (iv) the material is elastic

(d) Due to settlement of support in a fixed beam midspan bending moment

  (i) increases

  (ii) decreases

  (iii) remains unchanged

(e) If the supports of a three-hinged arch yield horizontally by a small amount, the horizontal support reaction

  (i) decreases

  (ii) increases

  (iii) remains the same

(f) At the location of an intermediate simple support of a continuous beam, the corresponding conjugate beam will be

  (i) a simple support

  (ii) a fixed support

  (iii) a free-end

  (iv) internal hinge

'g) A point load of 50 kN acting centrally on a simply supported beam produces the same maximum deflection in the beam as caused by a UDL of 20 kN/m over the whole span The span of the beam is

(i) 10 m

(ii) 8 m

(iii) 6 m

(iv) 4 m

(h) If fixity of support increases in a simpl supported beam, central deflection

(i) increases

(ii) decreases

(iii) does not change

(i) Castigliano's theorem is applicable

(i) when the system behaves elastically

(ii) only when principle of superposition is valid

(iii) None of the above

(j) The three-moment equation written for an intermediate support of a continuous beam expresses the condition of

(i) slope compatibility at that point

(ii) moment equilibrium at that point

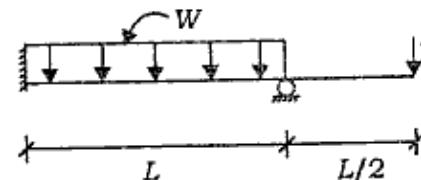(iii) zero deflection at the support point

(iv) structural stability

2. Determine the reaction components of the two supports as shown below :
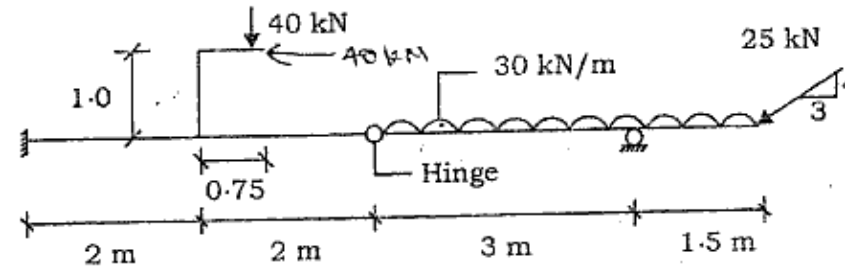
3. Analyze the space truss as shown below :-
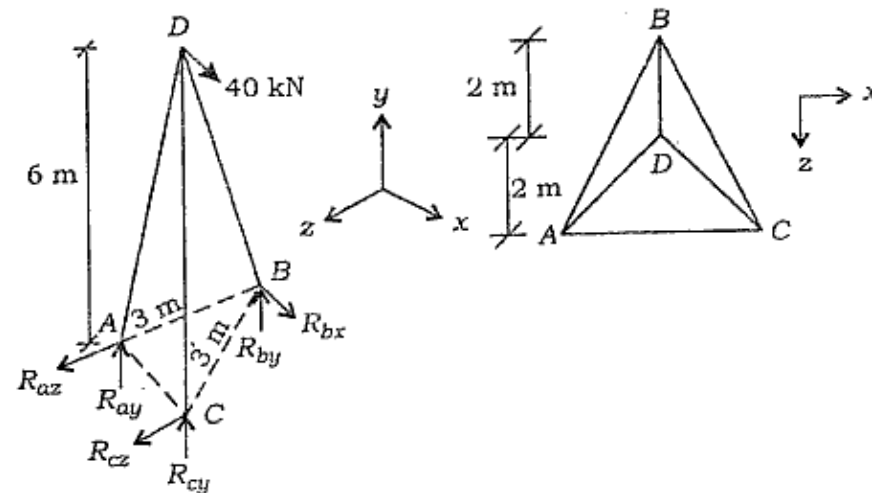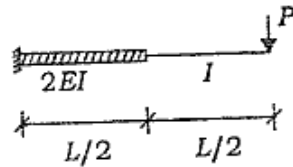

4. Determine the deflection under load point for the beam shown below. EI is constant :

5. Write the theorem of three moments considering support settlement, explaining meaning of notations used.

6. Using energy equations, find the deflection under the load point of the beam.

$$\begin{array}{c} \text{2EI} \qquad I \qquad \downarrow P \\ \vdash\!\!\!-\!\!\!-\!\!\!L/2\!\!\!-\!\!\!-\!\!\!\vdash\!\!\!-\!\!\!-\!\!\!L/2\!\!\!-\!\!\!-\!\!\!\dashv \end{array}$$
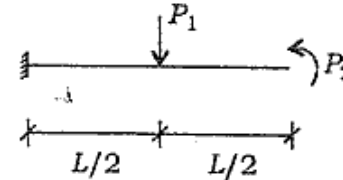
7. Two wheel loads, 160 kN and 90 kN, spaced 4 m apart, are moving over a simply supported beam of 12 m span. Determine the maximum shear force and moment that may be developed any where on the beam.

8. Generate flexibility matrix for coordinates 1, 2 and 3 of the frame.
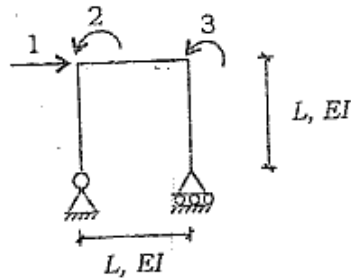
9. Considering only bending deformation, determine the flexibility matrix f and stiffness matrix k of the section shown below. EI is constant :

$$\begin{array}{c} \downarrow P_1 \\ \vdash\!\!\!-\!\!\!-\!\!\!L/2\!\!\!-\!\!\!-\!\!\!\vdash\!\!\!-\!\!\!-\!\!\!L/2\!\!\!-\!\!\!-\!\!\!\dashv \end{array} \quad P_2$$

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