

Code: 9A01701

B.Tech III Year I Semester (R13) Regular Examinations December 2015

FINITE ELEMENT METHODS IN CIVIL ENGINEERING

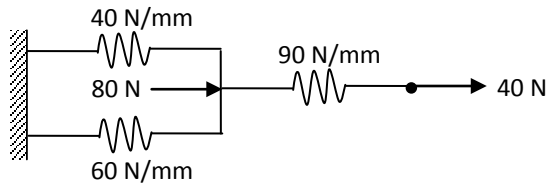
(Civil Engineering)

Time: 3 hours

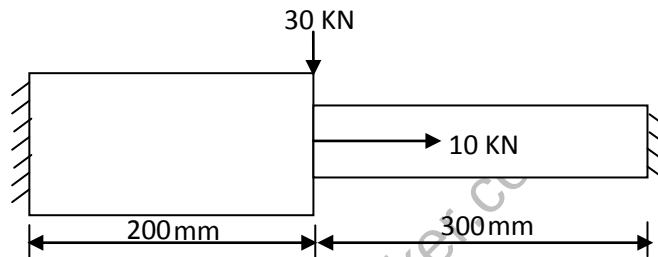
Max Marks: 70

Answer any FIVE questions
All questions carry equal marks

- 1 Determine the displacement of nodes of the spring systems shown in figure below.

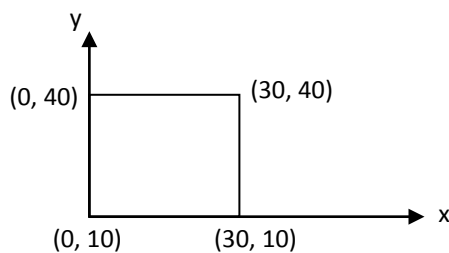


- 2 What is constitutive law? Write the constitutive relationships for plane stress, plane strain and axisymmetric states of stress.
- 3 Analyze the given structure in figure below using finite element concept. Take $E = 200 \mu\text{Pa}$.



Take moment of inertia as $12 \times 10^4 \text{ mm}^4$ and cross sectional area as 1000 mm^2 .

- 4 (a) Derive the relation between the nodal displacements and generalized co-ordinates from basics.
(b) Explain geometric invariance in FEM.
- 5 Derive the shape function matrix strain displacement matrix, stiffness matrix and nodal load vectors for a CST element.
- 6 For the element shown in figure below, determine the Jacobian matrix and strain displacement matrix for the Gaussian point (0.6, 0.6).



- 7 Derive the strain displacement matrix and stiffness matrix for 4-noded iso-parametric axis-symmetric element.
- 8 Write short notes on:
(a) Numerical integration.
(b) Natural co-ordinate system.