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Question Paper Code : 82308

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Second Semester

Structural Engineering

ST 9221/ST 921/UST 9121/10211 SE 201 — FINITE ELEMENT ANALYSIS

(Regulation 2009/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

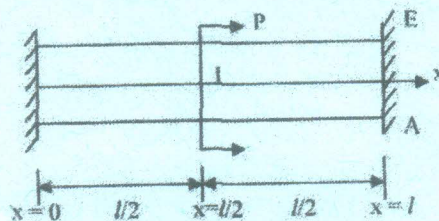
1. What are the methods associated with the finite element analysis?
2. What are the characteristics of a shape function?
3. How do you calculate the size of the global stiffness matrix?
4. What is the purpose of isoparametric elements?
5. What are h and p versions of finite element method?
6. What is meant by error evaluation in FEM?
7. Give two examples of geometric non linear problems.
8. Define dynamic condensation.
9. List out the two advantages of post-processing.
10. Name any four FEA softwares.

PART B — (5 × 16 = 80 marks)

11. (a) Find the deflection of a simply supported beam of span 1 subjected to a udl throughout its length using Galerkin's method.

Or

- (b) Using Rayleigh-Ritz method, determine the expressions for displacement and stress in a fixed bar subject to axial force P as shown in fig. Take three terms in displacement function. (E -Young's Modulus; A -Cross Sectional area)



12. (a) Derive an expression for the strain displacement matrix for an axisymmetric triangular element.

Or

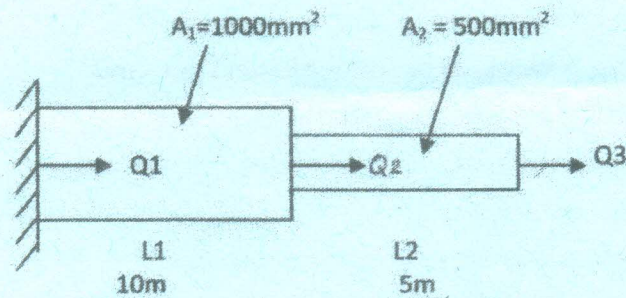
- (b) Evaluate the nodal load vector due to self weight of a four noded rectangular element with two degrees of freedom (translations) at each node. Use Gauss quadrature method of numerical integration.
13. (a) Determine the buckling load of a square uniform plate dividing it into a mesh 3×3 size. The plate is simply supported and advantage may be taken of symmetry of the mode of buckling.

Or

- (b) Describe the various types of errors in FE analysis.
14. (a) What are the methods of treatment available for the nonlinear equations? Explain any one of them.

Or

- (b) Determine the eigenvalues and eigenvectors for the stepped bar shown in fig.



Take $E = 205000\text{ MPa}$ and specific weight $= 27680\text{ kg/m}^3$

15. (a) Explain the generation of node numbers in FE analysis using softwares.

Or

- (b) Describe the post processing.