

Registration No. :

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Total number of printed pages – 2

B. Tech
FEME 6301

Sixth Semester Back Examination – 2015

FINITE ELEMENT METHOD

BRANCH : MECH

QUESTION CODE : M 358

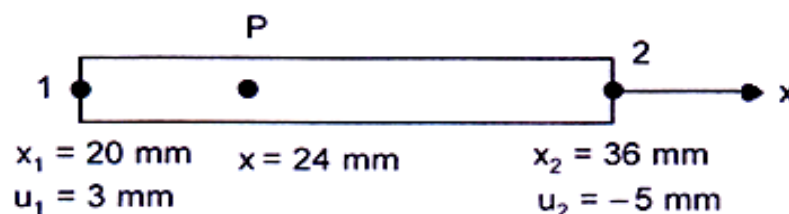
Full Marks – 70

Time : 3 Hours



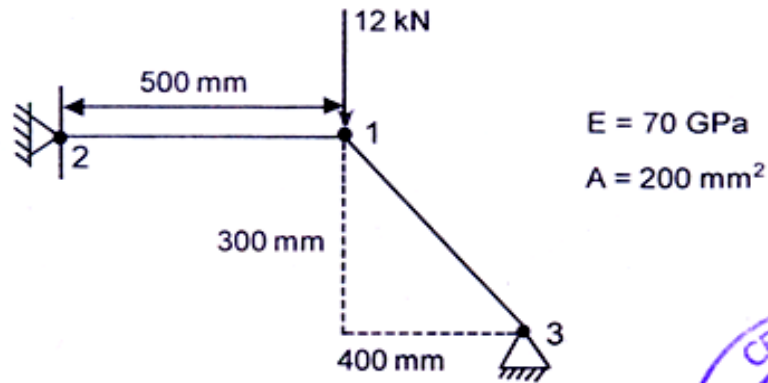
Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
 - (a) What is meant by degrees of freedom ?
 - (b) During discretization, mention the places where it is necessary to place a node.
 - (c) Differentiate between global coordinates and local coordinates.
 - (d) State the characteristics of shape functions.
 - (e) What is isoparametric elements ?
 - (f) Write the shape function for a truss element.
 - (g) State the necessary conditions for a problem to be axisymmetric.
 - (h) Why polynomial type of interpolation functions are mostly used in FEM ?
 - (i) List the advantages of post-processing.
 - (j) List the commercial FE codes available for finite element analysis.
2.
 - (a) Briefly describe the general steps of the finite element method. 5
 - (b) Explain the discretization process. 5
3.
 - (a) Derive the shape function a 1D bar element. 5
 - (b) A one dimensional bar is shown in Fig below. Calculate the following : 5
 - (i) Shape function N1 and N2 at point P.
 - (ii) If displacement at node 1 is 3 mm and displacement at node 2 is –5mm, calculate the displacement u at point P.

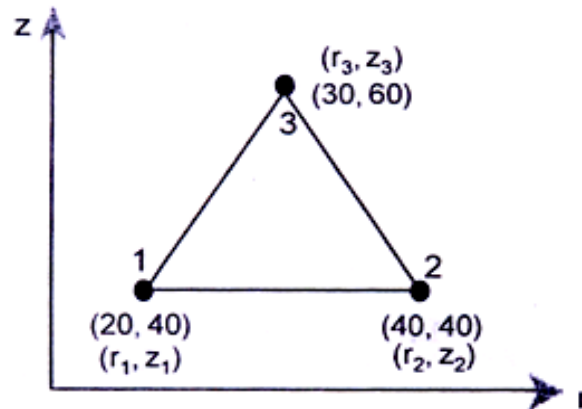


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4. For the two bar truss shown in figure below, determine the displacements of node 1 and the stress in element 1-3. 10



5. (a) Derive the shape function for a 2D beam element. 5
 (b) Derive the shape functions for a Constant Strain Triangle element. 5
6. (a) From basics derive the shape functions and strain-displacement matrix for axisymmetric element with constant strain triangular elements. 5
 (b) The nodal co-ordinates for an axisymmetric triangular element areas shown in the figure below : Evaluate [B] matrix for this element. 5



7. Derive a finite element equation for one dimensional heat conduction with free end convection. 10
8. Write short notes on any **two** : 5 × 2
- Rayleigh-Ritz method
 - Minimum potential energy principle
 - Advantages and disadvantages of FEM
 - Plain stress and Plain stress problem.