Registration No. : | | | | | | | | | | |

Total number of printed pages – 2

B. Tech

FEME 6301

Sixth Semester (Special / Back) Examination – 2013

FINITE ELEMENT METHOD

BRANCH : MECH

QUESTION CODE : E369

Full Marks – 70

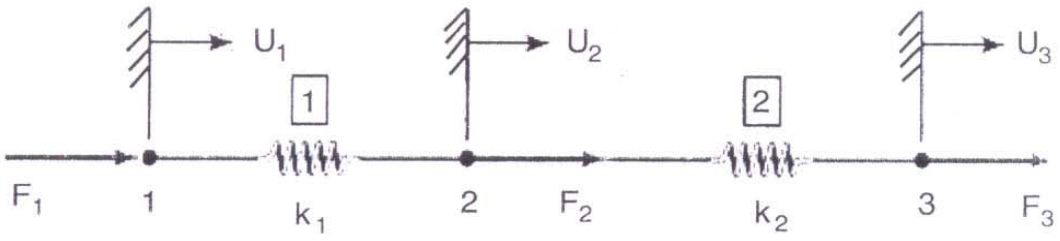
Time : 3 Hours

*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 Finite element analysis ?
   (b) What are the types of load acting on the structure ?
   (c) What is meant by degrees of freedom ?
   (d) What is global coordinates ?
   (e) What is a truss element ?
   (f) State the principle of minimum potential energy ?
   (g) Define shape functions.
   (h) Write down the constitutive law.
   (i) What is a CST element ?
   (j) What is preprocessing in FEM mean ?

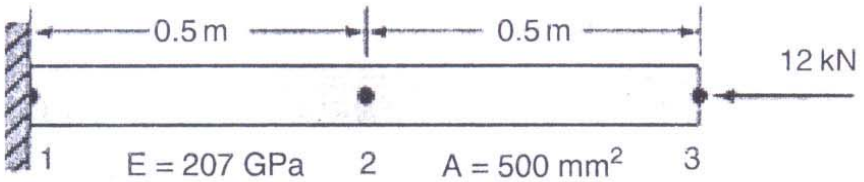
2. Describe the general steps to be followed in finite element analysis. 10

3. Consider the two element system depicted in Figure below given that Node 1 is attached to a fixed support, yielding the displacement constraint $U_1 = 0$. $k_1 = 10$ N./cm., $k_2 = 15$ N./cm., $F_2 = F_3 = 30$ N. for these conditions determine nodal displacements U_2 and U_3. 10



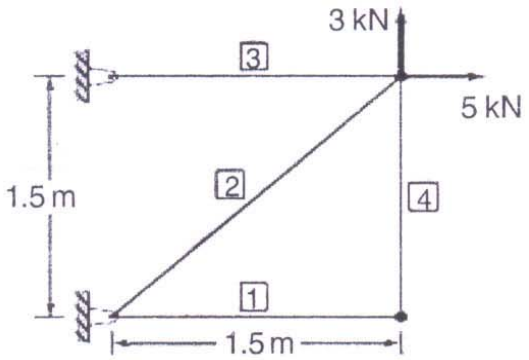
P.T.O.

4. A steel rod subjected to compression is modeled by two bar elements, as shown in Figure below. Determine the nodal displacements and the axial stress in each element. 10



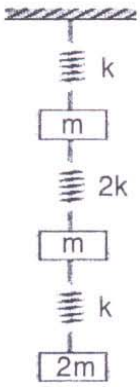
5. Derive the shape functions for a constant strain triangular elements 10

6. The plane truss shown in Figure below is composed of members having a square 15 mm ×15 mm cross section and modulus of elasticity E = 69 GPa. 10



(a) Assemble the global stiffness matrix.
(b) Express the finite element equation for this.

7. (a) Derive the stiffness matrix for one dimensional heat conduction element. 5
(b) Give the FE modeling for vibration of the system given in figure below : 5



8. Write short notes on any **two** of the following : 5×2
(a) Advantages and disadvantages of FEM
(b) Plane stress and plain strain problems
(c) Galerkin Methods.
(d) Isoparametric elements.
