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Total Number of Pages :2

M.TECH

M.TECH 2ND SEMESTER (AR 18) REGULAR EXAMINATIONS, APRIL/MAY 2019
FINITE ELEMENT METHOD

Branch: MD, Subject Code:MMDPE2031

Time: 3 Hours

Max Marks : 70

PART-A**(10 X 2=20 MARKS)****1. Answer the following questions.**

- What is global coordinates and local coordinates?
- What is Rayleigh-Ritz method?
- State the characteristics of shape functions ?
- How frame structure is different from bars?
- What is the importance of Pascal's triangle in FE analysis?
- What are the necessary conditions for a problem to be axisymmetric?
- How many engineering constants are to be evaluated for finding out the elasticity matrix for an orthotropic material?
- What isoparametric elements signify?
- Write down the stiffness matrix equation for one dimensional heat conduction element.
- Why post processing is required in FEA.

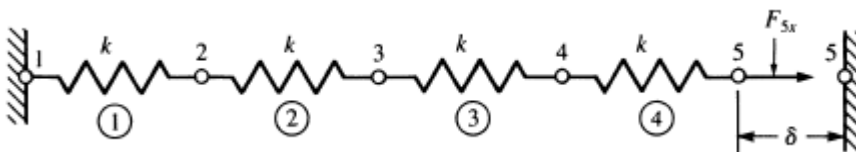
PART-B**(5 X 10=50 MARKS)****Answer any five questions from the following.**

Q.2.

- What do you mean by weak formulation? State its advantages. [5]
- Compare Ritz method with nodal approximation method. [5]

Q.3.

- Obtain the global stiffness matrix for the spring assemblage shown in Figure- 1 and also find the displacements of nodes 2–4,. Node 1 is fixed while node 5 is given a fixed, known displacement $\delta = 20.0$ mm. The spring constants are all equal to $k = 200$ kN/m. [5]



- Draw a typical three dimensional element and indicate state of stress in their positive senses. [5]

Q.4.

- Write down the strain displacement equations. [5]
- Explain the term 'Axi-symmetric problems' and give constitutive law for such problems. [5]

Q.5.

- a) State and explain the minimum potential energy principle and also derive the equilibrium equation . [5]
- b) Calculate the nodal displacement and forces for the stepped bar with the stiffness values are 12kN/m and 8kN/m and a load of 6kN is subjected at the end of the stepped bar and the other end of the bar is fixed. [5]

Q.6.

- a) What are the necessary requirements for convergence and explain about h- and p- refinement. [5]
- b) Define shape shape function and its properties [5]

Q.7.

- a) The (x,y) coordinates of the nodes I,j and k of a triangular element are (1,1), (4,2) and (3,5) respectively. The shape functions of a point P located inside the element are given by $N_1 = 0.15$ and $N_2 = 0.25$. Determine the x and y coordinates of the point P. [5]
- b) Obtain the functional approach of finite element equations for a one dimensional heat conduction problem. [5]

Q.8. Write short notes on :

- a) Penalty approach [5]
- b) CST [5]

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