Jaypee University of Information Technology, Waknaghat

T 1 Examination – September 2019

M. Tech. 1st Semester (Structural Engineering) & B. Tech. 7th Semester (Civil Engineering)

Course Code: *13M1WCE131*   Max. Marks: *15*
Course Name: *Finite Element Methods*
Course Credit: *03*   Max. Time: *60 Minutes*

Note: All questions are compulsory. Carrying of mobile phone during examination will be treated as case of unfair means. Assume any missing data.

Q.1 A springe assemblage shown in figure:1 is connecting five spring elements. Determine the displacement at Node 2 and 3 and the reaction at node 1 and 4. Assume the rigid vertical bars at node 2 and 3 connecting the springs remains horizontal at all times but are free to side or displace left or right. There is an applied force at node 3 of 2000 N to the right. Stiffnesses for spring no. 1 - 5 are 300 N/mm, 400 N/mm, 500 N/mm, 600 N/mm, and 700 N/mm, respectively.
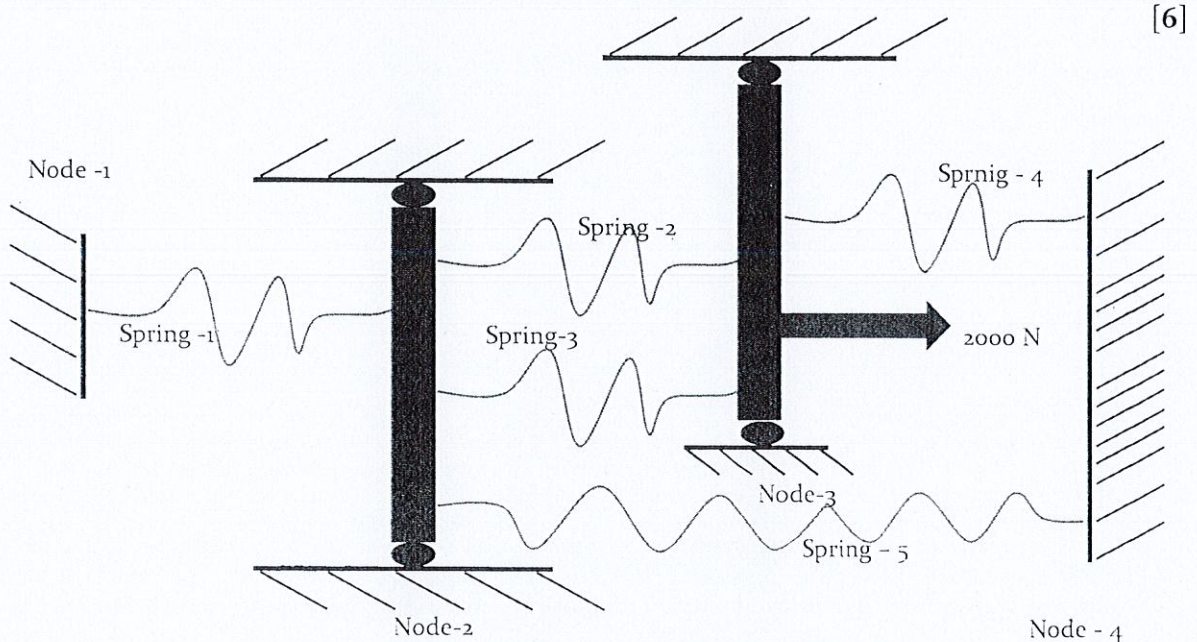
[6]

Figure: 1 Spring assemblage of five springs

Q.2 A spring assemblage shown in figure:2. Obtain i) global stiffness matrix, ii) displacement at node 1, 2, and 3, iii) the global nodal forces, iv) the local element force. Node 4 is fixed while node 5 is given a fixed, known displacement of 10 mm. The stiffnesses per unit length for spring no. 1 – 4 are 200 kN/m/m, 300 kN/m/m, 400 kN/m/m, and 200 kN/m/m, respectively. Assume springs are linear elastic in nature. Length of spring no. 1 – 4 are 1 m, 2 m, 2 m, and 1 m, respectively.   [5]
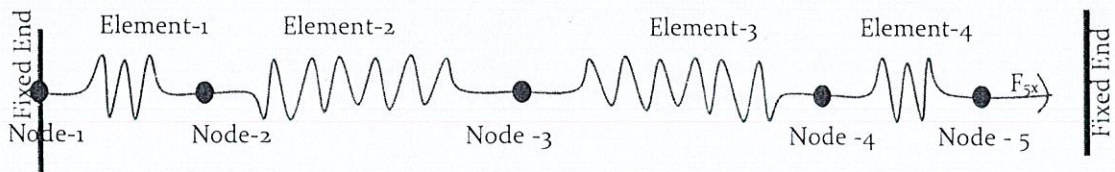
Q.3 Write the general steps of the finite element method. Also, write the advantages of finite element method comparing conventional approaches.   [4]