B.TECH SEM – VIII (2007 COURSE) (MECHANICAL ENGG.)
: WINTER - 2017
SUBJECT: FINITE ELEMENT METHOD

Day: Monday
Date: 20/11/2017

W-2017-2691

Time: 02.30 PM TO 06.30 PM
Max. Marks: 80

N.B:

1) **Q. No.1** and **Q. No.5** are **COMPULSORY.**
2) Out of the remaining attempt **ANY TWO** questions from each section.
3) Answers to the two sections should be written in **SEPARATE** answer book.
4) Draw neat and labeled diagrams **WHEREVER** necessary.
5) Figures to the right indicate **FULL** marks.
6) Assume suitable data if **NECESSARY.**

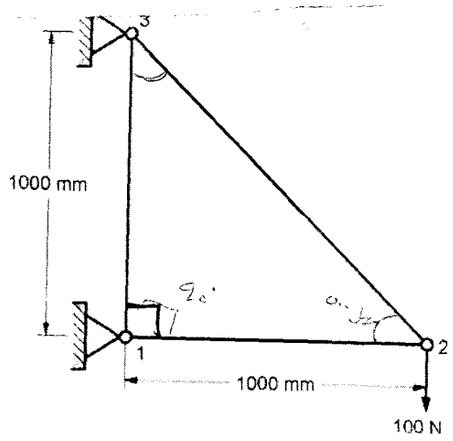
SECTION-I

Q.1 a) Explain the conversion in FEM. **(05)**
b) Explain different types of boundary conditions with suitable example. **(05)**
c) Explain short note on higher order element. **(04)**

Q.2 Explain weighted residual method with examples. **(13)**

Q.3 A steel tapered bar of 1200 mm length has the cross-sectional areas of 450 mm^2 and 150 mm^2 at two ends. It is fixed at large end and subjected to tensile load of 35 kN at free end. The modulus of elasticity for the material is 2×10^5 N/mm^2. Model the bar with three finite elements each having length of 400 mm and calculate the stresses in each element. **(13)**

Q.4 Following Figure shows a truss consisting of three elements whose EA/L value is 1000 N/mm. Using finite element method determine the deflection at node 2. **(13)**



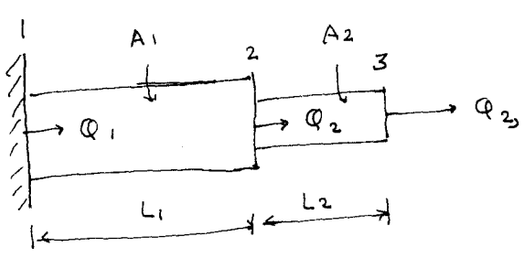
SECTION-II

Q.5 a) Explain choleski methods for solving Eigen value problem. **(05)**
b) Explain Galerkin approach for beam. **(05)**
c) How FEM is applied to solve free vibration problem. **(04)**

Q.6 Explain Jackobi and Subspace method. **(13)**

Q.7 Derive the element stiffness matrix and load vector for bearn. **(13)**

Q.8 Determine Eigen value and Eigen vectors for steeped bar shown below. **(13)**



$L_1 = 254$ mm
$L_2 = 127$ mm
$A_1 = 645.16\ mm^2$
$A_2 = 322.58$
$E = 200$ GPA.