Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

IISEMESTER MTECH (STRUCTURAL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2017

SUBJECT: FINITE ELEMENT METHOD OF ANALYSIS - II [CIE 5251]

REVISED CREDIT SYSTEM
(/ /2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Obtain the Jacobian matrix for eight noded brick element with dimensions 0.4 m along X-direction, 0.6m along Y direction and 0.3 m along Z direction and the origin at node 1.	**5**
1B.	Explain the procedure to obtain stiffness matrix for eight noded plate bending element	**5**
2A.	Using the principle of minimum potential energy obtain the relationship for dynamic equation of equilibrium kq+mq=f(t)	**3**
2B.	Condense the stiffness matrix and load vector by eliminating the degrees of freedom q2 for the following equation of equilibrium using Gauss elimination technique $\begin{bmatrix} 12 & 10 & 6 \\ 10 & 14 & 4 \\ 6 & 4 & 12 \end{bmatrix} \begin{Bmatrix} q1 \\ q2 \\ q3 \end{Bmatrix} = \begin{Bmatrix} 70 \\ 80 \\ 40 \end{Bmatrix}$	**5**
2C.	Differentiate between incremental and iterative procedures for material non linearity	**2**
3A	Obtain the Eigen values and Eigen vectors for a cantilever beam of length 3 m. The geometric and material properties are as follows: c/s area = 0.3 m^2 moment of inertia = $1x10^{-4}m^4$ Mass density = 25 $kNse^2/m^4$ modulus of elasticity = $2x10^7$ kN/m^2	**6**
3B	Explain mesh refinement v/s higher order elements	**4**
4A	Explain the iterative procedure for material nonlinearity	**5**
4B	Obtain the geometric stiffness matrix for two noded pin jointed element in local and global directions	**5**
5A	Explain elastic half space approach for soil-structure interaction analysis	**4**
5B	Obtain the shape functions for four noded triangular element using the shape functions of six noded triangular element	**3**
5C	Explain sub structure technique	**3**