Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL/MAY 2018

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

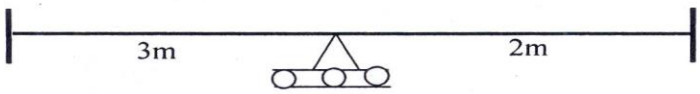
REVISED CREDIT SYSTEM

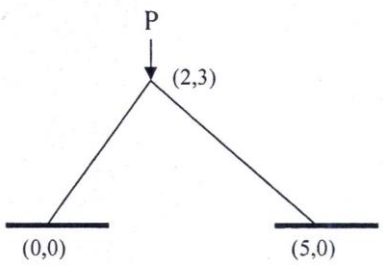
(17/ 04/ 2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

Q.No		CO/MARKS
1A.	Explain the procedure to obtain stiffness matrix for eight noded isoparametric brick element when used for the analysis of three-dimensional problems	**CO1 04**
1B.	Obtain the matrix B at the centre for four noded plate bending element with coordinates (0,0), (0.5,0),(0.5,0.5) and (0,0.5) at the nodes 1,2,3 and 4 respectively.	**CO1 04**
1C.	Differentiate between Mindlin and Kirchoff theories for analysis of plates using finite element method	**CO1 02**
2A.	Obtain the equation of equilibrium for beam element of length 1 m and EI 1000 kNm^2 with vertical displacement and rotational degrees of freedom at node 1 and only vertical displacement degree of freedom at node 2.	**CO6 03**
2B.	Obtain the Eigen values and Eigen vectors for a continues beam shown in figure Fig. Q. 2(B). Take mass on each element ρA = 20kNsec^2/m^2 and EI = 2000 kN.m^2  Fig. Q. 2B	**CO2 07**
3A.	Explain the procedure to obtain consistent mass matrix for four noded isoparametric plane stress element	**CO2 04**
3B.	A column of length 2 m, *c/s* area 02 m^2 and modulus of elasticity 2x10^7 kN/m^2 is subjected to a load of 200 kN. Calculate the displacement after two increments using midpoint Runge Kutta method. The constitutive model for the material is given by the equation Ki= K(1-10^{4}qi) where K is the elastic stiffness and Ki is the stiffness at displacement qi. Apply the load in increments of 20 kN	**CO3 06**

4A.	Calculate the critical load for the structure connected with pin joints shown in Fig. Q4A. Take AE/L=50000 KN/m for both the members  **Fig. Q 4A**	**CO4** **07**
4B.	Obtain the shape functions for two noded bar element using the shape functions of three noded bar element	**CO6** **03**
5A.	Obtain the stiffness matrix for a retaining wall of height 4 m supported on footing of total length 2 m (1 m each on either side of the wall). Soil behind the wall is filled upto the top of the wall and hard rock is available at a depth of 2 m below the footing. Take the extent of soil behind the wall upto 3 m from the wall. Divide the wall and footing of retaining wall using two elements and model the soil using Winkler elements. Following are the properties of soil and retaining wall **Retaining wall and its footing:** $AE=1x10^7$ kN $EI=8000$ kNm^2 Soil: $E=10000$ kN/m^2	**CO5** **06**
5B.	Explain a) band width and its minimization b) finite descretization of infinite bodies	**CO6** **04**