Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, APR/MAY 2019

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

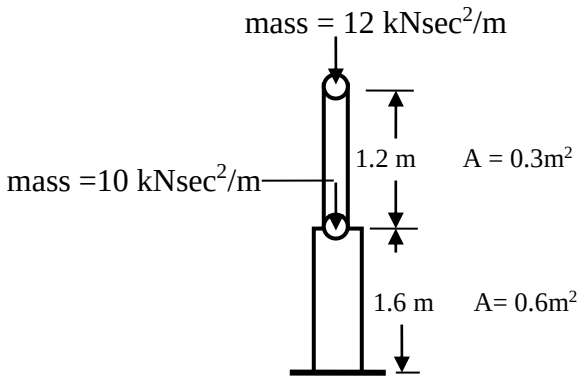
REVISED CREDIT SYSTEM

(/ / 2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

Q. No		MARKS	COS
1A.	Explain the procedure to obtain equivalent nodal load vector for eight noded brick element due to surface traction on the surface 5,6,7,8 acting along vertical direction	**03**	**CO1**
1B.	Explain the procedure to obtain stiffness matrix for eight noded thick plate bending element	**04**	**CO1**
1C.	Show that mass matrix in local direction is similar to mass matrix in global direction for two noded plane truss element	**03**	**CO2**
2A.	Write the finite difference equation to obtain the response at time 5 sec for a pin jointed element with coordinates (1,-1,1) at node 1 and (2,3,-1) at node 2 due to sinusoidal load of intensity F(t) = 2sin(6t) acting at node 2 along x-direction. Displacement along all directions are restrained at node 1. Take E= $2x10^7$ kN/m^2, c/s area 0.2m^2 and mass density 8 kNsec^2/m^4.	**03**	**CO2**
2B.	Calculate the response of axially loaded structure shown in figure Fig Q 2B at 2 sec due to suddenly applied load 10 kN at free end. Take E= $2x10^7$ kN/m^2 and mass density 7.5 kN sec^2/m^4  **Fig. Q 2B**	**07**	**CO2**

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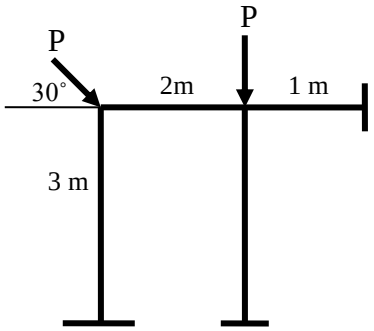
3A	Calculate the critical load P for a rigid jointed structure shown in Fig. Q 3A. Neglect axial and shear deformations. Take EI= 1000 kNm^2  **Fig. Q 3A**	**05**	**CO4**
3 B	Calculate the deformation for axially loaded structure of length 2 m and c/s area 0.6 m^2 due to 500 kN load. Use the constitutive relationship relating the modulus of elasticity, Ei, and axial displacement, q, as Ei=2.2x10^7(1-5000q)^3. Use incremental procedure and 100 kN increment load	**05**	**CO3**
4A	Wall of height 3 m and thickness 0.3m is fixed at the base and pushes the soft soil behind the wall with a point load of 100 kN at the top. Write the equation of equilibrium to model the wall and soil behind the wall. Take the modulus of elasticity for structure and soil as 2x10^6 kN/m^2 and 5000 kN/m^2 respectively. Assume unit length along the longitudinal direction and use minimum three elements to model the wall.	**05**	**CO4**
4B	Explain band width and its minimization. Obtain the minimum band width for a plate of size 2.4 m x 4.8 m descritized using plane stress element of size 0.6 m x 0.6m.	**05**	**CO5**
5A	What is substructure technique? Explain how the substructure technique is useful in the analysis of plane frame structure considering the effects of infill	**05**	**CO5**
5B	Write short notes on i) Descritization of very large bodies ii) static condensation by Gauss elimination technique	**05**	**CO5**