Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

I SEMESTER M.TECH (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

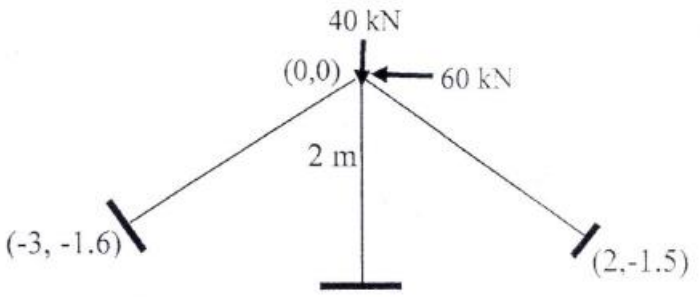
SUBJECT: FINITE ELEMENT METHOD OD ANALYSIS-I [CIE-543]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** the questions.
- Missing data may be suitable assumed.

1A.	List the various types of elements used for descretization of structure in finite element analysis. Discuss the type of problems where each of these elements are used.	**4**
1B.	List the two dimensional type of problems. Obtain the relationship between stress and strain for these problems	**4**
1C.	Write the displacement model for i) four noded beam element ii) eight noded plane stress element	**2**
2A.	Explain the procedure to obtain the overall stiffness matrix for the structure from element stiffness matrices using principle of minimum potential energy	**4**
2B.	Three noded bar element of length 1.6m is subjected to a load varying from 10 kN/m at node 1 to 20 kN/m at node 2 on one of its surface and a point load of 20 kN at a distance of 0.6 m from node 1, both loads acting along the axis of the element. What is the equivalent nodal load vector due to these loads	**6**
3A.	Using principle of minimum potential energy obtain the expression for stiffness matrix for two noded bar element	**3**
3B.	Obtain the displacement at nodes and forces in anyone member of the pin connected structure shown in figure Fig. Q. 3 (b). Take *cis* area = 0.2 m^2 and E = 2xl0^7 kN/m^2 for all the members  Fig. Q 3 (b)	**7**

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4A.	The displacement vector ^{qT} in local direction for two noded plane frame element of length1.2m is $q^T = 1x10^{-2}$ [0.1 0.16 0.06 0.132 -0.32 0.18]. Calculate the forces in local direction of the element if it carries a udl of 20 kN/m acting perpendicular to the element and a point load of 20 kN at 0.6 m from node I acting along the direction of element. Take EI= 150 kNm^2 and AE= 2x 10^4 kN	**6**
4B.	Obtain the shape functions for two noded beam element	**4**
5A.	Six noded triangular element is subjected to a load varying from 10 *kN/m* at node 2 to 20 kN/m at node 3 acting along positive X- direction on the side 2-3 of length 1.2m and a point load of 100 kN acting down word direction at its centre of gravity. Calculate the equivalent nodal load vector due to these loads	**5**
5B.	Explain the procedure to obtain stiffness matrix for three noded plane stress triangular element	**5**
6A.	Explain i) natural coordinate system for triangular elements ii) Hermetian interpolation functions	**4**
6B.	Explain the procedure to obtain stiffness matrix for eight noded quadrilateral element	**6**