Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, MAY /JUNE 2016

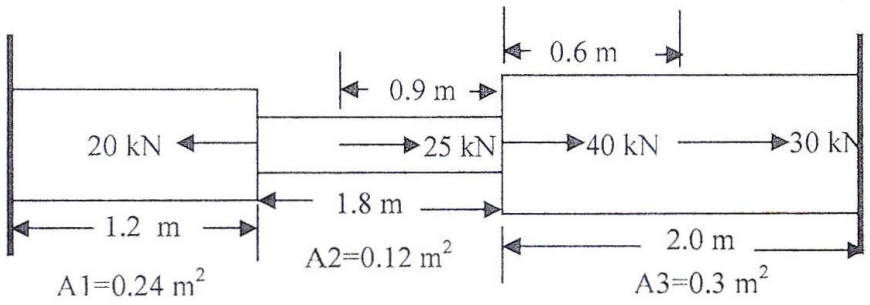
SUBJECT: FINITE ELEMENT METHOD OF ANALYSIS [CIE 328]

REVISED CREDIT SYSTEM

Time: 3 Hours 11/05/2016 MAX. MARKS: 50

Instructions to Candidates:

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

1A.	List the various types of problems where one dimensional element is used. Write the degrees of freedom for each of these problems	**4**
1B.	What is shape functions? Explain the various steps to obtain the shape functions for an element	**4**
1C.	List the advantages of finite element method	**2**
2A.	What is transformation matrix T. show $T^T=T^{-1}$	**2**
2B.	Analyse the axially loaded structure shown in figure Fig. Q. 2A. Take modulus of elasticity equal to 2xl 0^7kN/m^2 for all the elements.  Fig. Q 2A	**8**
3A.	Using the principle of minimum potential energy explain the procedure to obtain equivalent nodal load vector for a two noded plane frame element of length L due to i) a point load P kN acting along the axis of the element at center and ii) uniformly distributed load of intensity W kN/m	**5**
3B.	A pin jointed structure with coordinates (0,0,0) at node 1, (3,-2,2) at node 2 and (-3,-2,-2) at node 3 consists of two members connected at node 1. Nodes 2 and 3 are provided with a fixed support and a load of 100 kN and 60 kN are applied at the node 1 along positive X and Y directions respectively. Obtain the equilibrium equation for the structure if node 1 is prevented from displacement along Z direction. Take E=2x 10^7kN/m^2 and area of both the members as 0.12 m^2	**5**
4A.	Two noded cantilever beam element of length 3 m and EI=1 00 kNm^2 is fixed at node 1. Calculate the forces in the element if it is subjected to the following loads:	**6**

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	i) a point load of 60 kN acting down word at node 2 ii) uniformly distributed load of 20 kN/m iii) clockwise moment of 25 kNm at node 2	
4B.	Obtain the shape functions for three noded triangular element	**4**
5A.	Calculate the strains for the three noded triangular element with coordinates (0,0) at node l, (1.2, 0) at node 2 and (0, 0.8) at node 3. The displacement at nodes along X direction and Y direction are as follows: ul= 0 vl= 0 u2=1.2x10^{-3} m , v2=-1.6x10^{-4} m u3 = 0 v3=1.12x10^{-3} m	**5**
5B.	Obtain the stress-strain relationships for i) three dimensional stress conditions ii) plane stress condition, What is the use of these relations in finite element analysis.	**5**
6A.	Obtain the Jocobian matrix for a quadrilateral element with coordinates at (1,1), (3,2), (3,6) and (1,5) at the natural coordinated r=0.25 and s= -0.25	**5**
6B.	Explain i) numerical integration technique ii) displacement model	**5**