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I SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: FINITE ELEMENT METHOD OF ANALYSIS –I [CIE 5152]

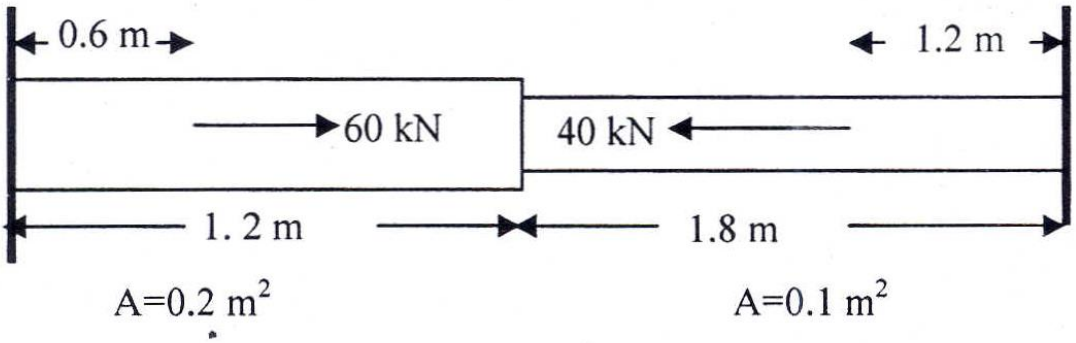
REVISED CREDIT SYSTEM

(/ /2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A.	Explain the various steps of finite element analysis	**3**
1B.	What is displacement model. Write the displacement model for three noded beam element and eight noded plane stress element.	**3**
1C.	Obtain Lagrange shape functions for three noded bar element	**4**
2A.	What is natural coordinate system? Obtain the stiffness matrix for two noded bar element using the shape functions in natural coordinate system	**4**
2B.	Calculate the equivalent nodal load vector for four noded rectangular element of sides 1.2 mx0.6 m due to i) Point load of 100 kN acting at a horizontal and vertical distances of 1 m and 0.2 m from node 1 respectively. ii) Surface load varying from 20 kN/m at node 2 to 30 kN/m at node 3. Both the loads are acting along positive X direction	**4**
2C.	What are the degrees of freedom for a plane frame element at node 112	**2**
3A.	What is transformation matrix. List the type of structures where transformation matrix is used to obtain the stiffness matrix.	**2**
3B.	For the axially loaded structure shown in figure obtain the displacements at 0.6 and 2.1 m from node 1. Take the modulus of elasticity as $2x10^7$ kN/m^2. Descretise the structure using three noded bar element. What are the stresses, strain and forces in each element  	**8**

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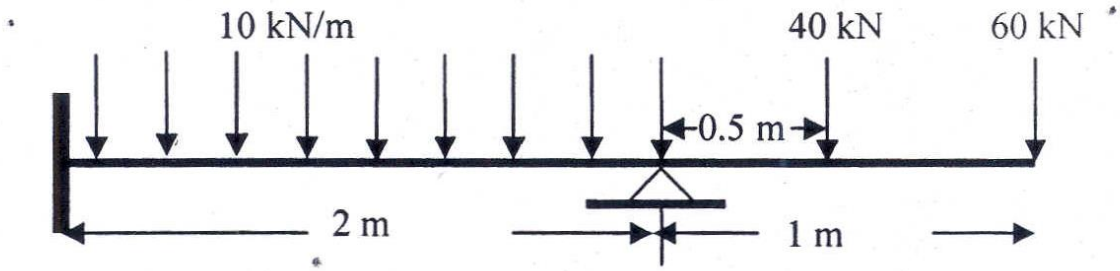
4A.	Obtain the transformation matrix for two noded plane frame element.	**2**
4B.	Analyse the continuous beam shown in figure. Take constant El for all the elements. 	**8**
5A.	Displacements at the nodes for six noded triangular element with coordinates (0,0) at node 1, (2,0) at node 2 and (0,3) are as follows: ul=O u2=0.000123 m u3= - 0.000142 m u4=0 u5=0 u6=0.000245 m vl=- 0.000562 m v2 =0 v3 = 0.000256 m v4=0 v5=0 v6=0 Obtain the strain displacement matrix at x= 1.2 m and y=0.6 m	**5**
5B.	Explain the procedure to obtain stiffness matrix for eight noded isoparametric element	**5**