Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E –IIst SEMESTER–EXAMINATION – JULY- 2012

Subject code: 1722001 **Date: 06/07/2012**

Subject Name: Finite Element Method

Time: 10:30 am – 13:00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Briefly discuss all the steps involved in finite element method.	**07**
	(b)	Discuss one dimensional, two dimensional and three dimensional elements used in finite element method. Also give the examples of the real life structures in which these elements are used for analysis.	**07**
Q.2	**(a)**	Discuss what you understand by iso-parametric elements. Derive the shape functions that are used for the nine nodded quadrilateral element in iso-parametric element.	**07**
	(b)	Discuss the use of pascle's triangle for selection of the displacement function. Also give the various examples for the same giving convergence criteria.	**07**
		OR	
	(b)	Discuss the use of axi-symmetric element in finite element method. Give the various strains those are to be considered for the same. Also give some real life structures those can be solved by axi-symmetric element.	**07**
Q.3	**(a)**	For a constant strain triangle element the three nodes are (0,0), (3,0) and (0,4), derive the strain displacement relationship matrix [B].	**07**
	(b)	For a three nodded one dimensional element having nodes at 0m, 2m and 4m, derive the shape functions and hence or otherwise derive the stiffness matrix.	**07**
		OR	
Q.3	**(a)**	For a rectangular element has corner coordinates as (0,0), (2,0), (2,1) and (0,1), derive strain displacement relationship matrix [B].	**07**
	(b)	For a beam element having length L, derive the strain displacement relationship matrix. Also calculate the consistent load vector if it is loaded by a udl over left half portion only.	**07**
Q.4		Analyze the continuous beam as shown in the figure.1 making use of symmetry. Take elements of length of 2m, EI = 20000kN-m^2.	**14**
		OR	
Q.4		Analyze the continuous beam as shown in the figure.1 if the supports B and C are spring supports having spring constant of 10000kN/m. Make use of symmetry, elements of size 2m and assume the value of EI = 20000kN-m^2.	**14**
Q.5	**(a)**	A simply supported beam of span 8m is loaded by three equal loads each of 100kN placed at 2m, 4m and 6m from the support. If EI = 3x10^4 kN-m^2, calculate the central deflection of the beam by minimizing the potential energy. Assume the deflection function as $c_1*x + c_2*x^3$.	**10**
	(b)	Derive the Stress-Strain relationship matrix [D] for the plane stress condition. Also give minimum three real life examples where it is used.	**04**
		OR	
Q.5	**(a)**	A cantilever beam of span 9m is loaded by three equal loads each of 100kN placed at 3m, 6m and 6m from the fixed support. If EI = 8x10^4 kN-m^2, calculate the central deflection of the beam by minimizing the potential energy. Assume the deflection function as $c_1*x^2 + c_2*x^3$.	**10**
	(b)	Derive the Stress-Strain relationship matrix [D] for the plane strain condition. Also give minimum three real life examples where it is used.	**04**

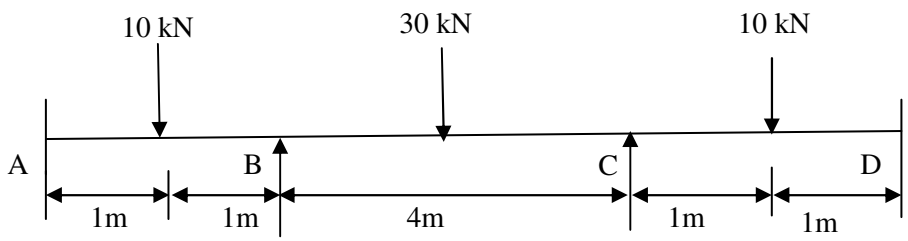

Figure.1