Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1724301 Date: 16-06-2014

Subject Name: Finite Element Method in Geo Technical Engineering

Time: 02:30 pm - 05:00 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)**	Explain in detail: (i) Pascalôs triangle (ii) Discretization	**07**
	(b)	Write K matrix for following elements: (i) Two noded Bar (ii) Plane Truss (iii) Beam	**07**
Q.2	**(a)**	For a spring assembly shown in fig-1 . Calculate Displacements at node 2 & 3 and Reactive forces	**07**
	(b)	Coarse gravelly medium is having fluid head at top is 20 cm & at bottom is 2 cm as shown in fig. 2.Take Permeability Coefficient 1 cm/sec. Use two noded ï three elements. Determine (i) The fluid head distribution along the length (ii) The velocity in each element	**07**
		OR	
	(b)	Derive K_{22} element of stiffness matrix for three nodded bar element.	**07**
Q.3		A bar is subjected to uniformly distributed load of 5 kN/m along the length as shown in fig.3 Find nodal displacements & element stresses considering, (i) 2 nodded = 2 elements (ii) 3 nodded = 1 elements Take A=600 mm^2 and E=200 GPa	**14**
		OR	
Q.3		For the beam shown in Fig.4, Determine the slope and deflection at óCô. E = 200 GPa and I = 4.0 x 10^6 mm^4.Take two elements.	**14**
Q.4		For the plane truss shown in fig.5, determine the nodal displacements and stresses in each element. All elements have E = 200GPa and A = 2000 mm^2.	**14**
		OR	
Q.4		For a thin plate shown in fig. 6, determine the deflections at node ó1ô and ó2ô. Also find out stresses in the elements considering two elements. Take plane stress condition, t=10mm, E=70000 MPa, ε = 0.3.	**14**
Q.5	**(a)**	List and draw, the shape functions and its variation, for four nodded plate element. Use Natural co-ordinate system.	**07**
	(b)	Derive strain displacement matrix for axisymmetric element.	**07**
		OR	
Q.5	**(a)**	Calculate the displacement at free end for a bar with uniformly varying area as shown in fig7. Treat it as a single element.	**07**
	(b)	Derive & draw the shape function & its variation, for two nodded and three noded bar element. Use Natural co-ordinate.	**07**

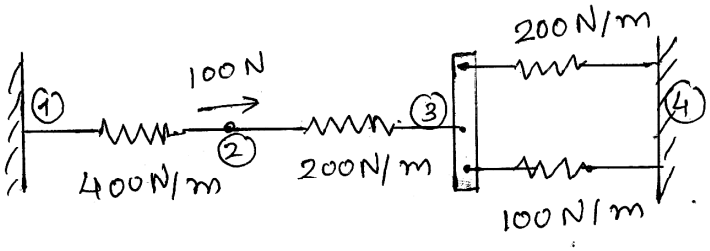

Fig. 1

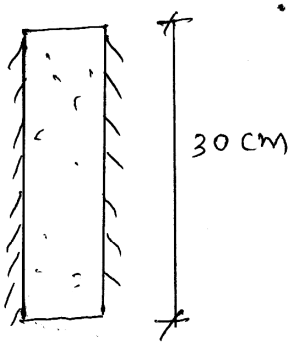

Fig. 2

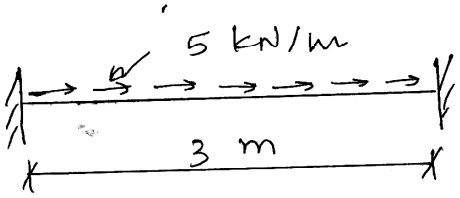

Fig. 3

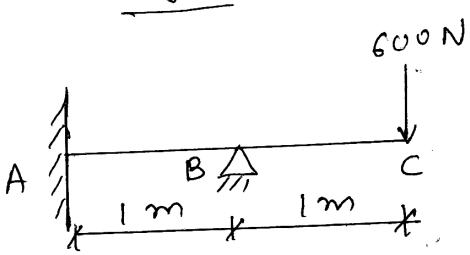

Fig. 4

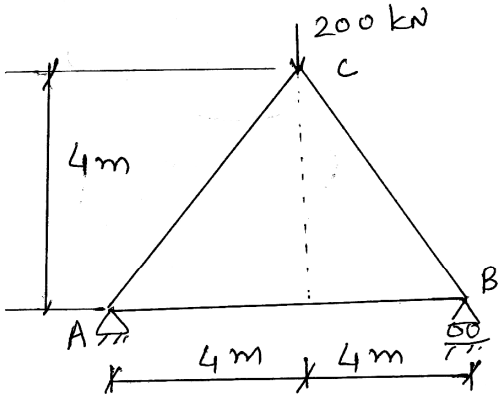

Fig. 5

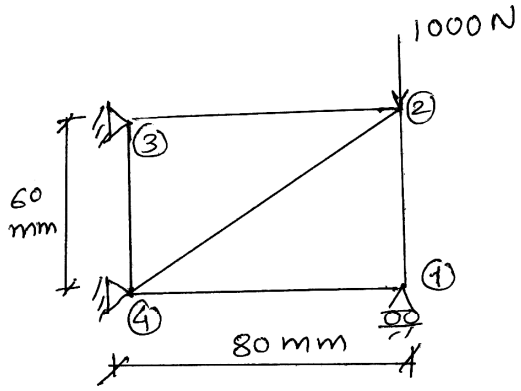

Fig. 6

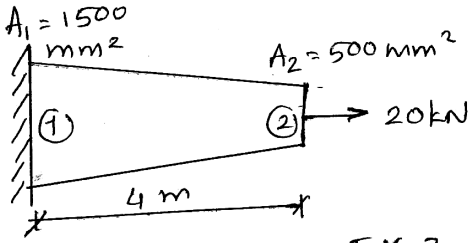

Fig. 7

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