CBCS SCHEME - Make-Up Exam

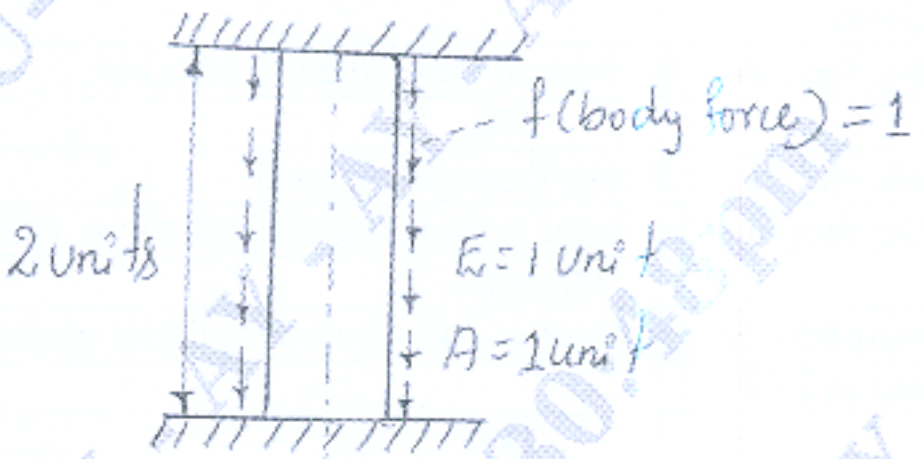
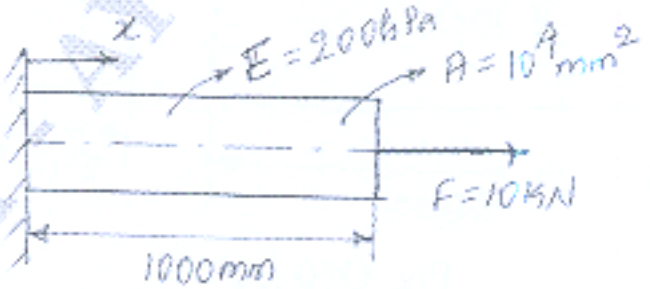
USN | | | | | | | | | | |

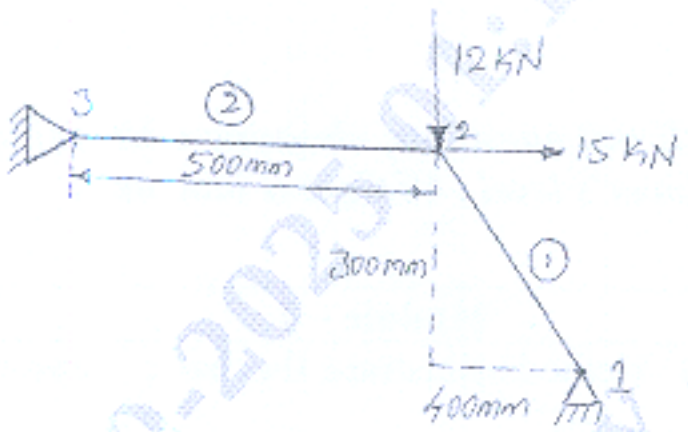
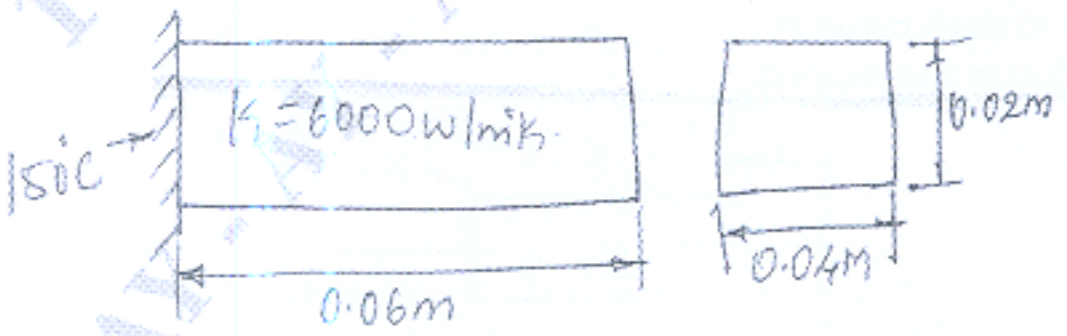
BAE/BAS515A

Fifth Semester B.E/B.Tech. Degree Examination, June/July 2025
Finite Element Methods

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, choosing ONE full question from each module.*
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
1	a.	Define Finite Element Method. Illustrate the basic steps involved in Finite Element method.	10	L2	CO1
	b.	State and Derive potential energy function for a three dimension body.	10	L3	CO1
		OR			
2	a.	Use Rayleigh-Ritz method to find the displacement at the mid point of the rod shown in Fig. Q2 (a).  Fig. Q2 (a)	10	L3	CO1
	b.	Describe plane stress and plane strain with examples and obtain there equations.	10	L2	CO1
		Module – 2			
3	a.	Derive shape function for a 1-D linear bar element in Global co-ordinate system.	10	L3	CO1
	b.	The below figure Fig. Q3 (b) shows a 1D bar subjected to an axial loading. Taking it as a single element, determine (i) Nodal displacements (ii) Stress in each element (iii) Reaction at the support.  Fig. Q3 (b)	10	L3	CO2

		OR			
4	a.	Obtain the equation for element stiffness matrices and load vector for bar element.	**10**	**L3**	**CO2**
	b.	For the two bar truss as shown in Fig.Q4 (b). Determine the displacements at node-2 and the stresses in both elements. Take E = 2×10^5 N/mm^2, A = 200 mm^2  Fig. Q4 (b)	**10**	**L3**	**CO2**
		Module – 3			
5	a.	Obtain the shape functions for 4-noded quadrilateral element in natural co-ordinate system.	**10**	**L3**	**CO2**
	b.	Derive the shape functions for 9-node Quadrilateral element.	**10**	**L3**	**CO2**
		OR			
6	a.	Explain constant and linear Strain Triangle element.	**10**	**L2**	**CO2**
	b.	Derive the shape function for Eight node hexahedral element. (HEXA – 8)	**10**	**L3**	**CO2**
		Module – 4			
7	a.	Explain Isoparametric, Subparametric and super parametric elements.	**10**	**L2**	**CO2**
	b.	Explain 3 phases in FEA.	**10**	**L2**	**CO2**
		OR			
8	a.	Derive the shape function for axisymmetric triangular element.	**10**	**L3**	**CO2**
	b.	Explain the characteristics of quadrilateral element and software packages available for FEM packages.	**10**	**L2**	**CO2**
		Module – 5			
9	a.	Derive the shape functions of a 1-D element with temperature T_1 and T_2 of the nodes.	**10**	**L3**	**CO3**
	b.	Obtain the elemental stiffness matrix for heat conduction in 1-D element.	**10**	**L3**	**CO3**
		OR			
10	a.	Explain three different modes of heat transfer.	**10**	**L2**	**CO3**
	b.	Find the temperature distribution in the 1-D fin shown in Fig. Q10 (b). Assume steady state heat transfer and only conduction process. Take heat generated inside the fin as 500 W/m^2.  Fig. Q10 (b)	**10**	**L3**	**CO3**

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