C **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 52U01

M.E. DEGREE EXAMINATION, MAY 2018

Second Semester

Structural Engineering

15PSE201 - FINITE ELEMENT ANALYSIS FOR STRUCTURAL ENGINEERING

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 1= 5 Marks)

1. The aspect ratio closer to_____ gives the exact solution CO1- R

(a) Unit value (b) 2 (c) infinity (d) 0.5

2. The sum of shape function is always equal to_____ CO2 -R

(a) 0 (b) 1 (c) 2 (d) 3

3. The shape function at node 1 for CST element is_____ CO3- R

(a) $\alpha_1+\beta_1x+\gamma_1y/2A$ (b) $\alpha_1+\beta_1x+\gamma_1y/3A$ (c) $\alpha_1+\beta_1y+\gamma_1x/2A$ (d) $\alpha_1+\beta_1x+\gamma_1y/4A$

4. In which method of mesh refinement ,n umber of elements are maintained constant and the order of polynomial approximation of element is increased. CO4 -R

(a) p method (b) s method (c) h method (d) None of these

5. The stress due to temperature difference is given by CO5- R

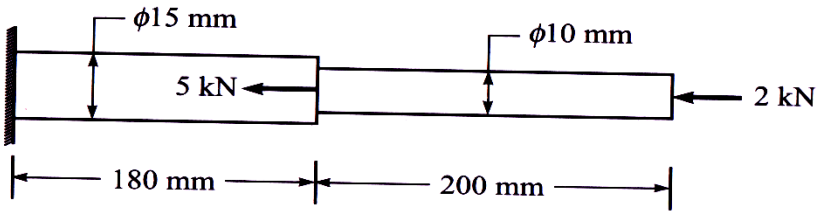
(a) $\alpha\Delta T$ (b) $\sigma\alpha\Delta T$ (c) $E\alpha\Delta T$ (d) $E\varepsilon\Delta T$

PART – B (5 x 3= 15Marks)

6.	List out any two FEM software packages.	CO1-U	
7.	State the properties of stiffness matrix.	CO2-U	
8.	Discuss CST element with a neat sketch.	CO3-U	
9.	Explain ill conditioned elements.	CO4-R	
10.	What is geometric non-linearity?	CO5-R	

PART – C (5 x 16= 80Marks)

11.	(a)	A simply supported beam is supported to an udl over the entire span. Determine the bending moment and deflection at the mid span using Rayleigh-Ritz formula and compare with exact solution. Use the first term in the trial function.	CO1-App	(16)
		Or		
	(b)	Explain the step-by-step procedure to solve a typical problem using FEA.	CO1-U	(16)
12.	(a)	Derive the element stiffness matrix for the one dimensional truss element	CO2- App	(16)
		Or		
	(b)	For the axially loaded bar as shown in figure, determine the nodal displacements, element stresses and reaction forces. E = 200GPa.	CO2- App	(16)



13.	(a)	Calculate the element stresses and strains for the axisymmetric element having coordinates of node 1, 2 & 3 in mm are (0,0), (60,0) and (0,60) respectively. The displacement vector $\{u\}^T$ is {0.06, 0.04, 0.02, 0.03, 0.01, 0.01} in mm. E= $2x10^5$ N/mm^2, Poissons ratio = 0.25.	CO3-App	(16)
		Or		

	(b)	Derive the strain-displacement relation matrix 'B' for a constant strain triangular element	CO3-App	(16)
14.	(a)	Discuss automatic mesh generation techniques and explain how the errors in FEM can be rectified to get accurate results.	CO4 - U	(16)
		Or		
	(b)	What is half band width in Finite Element Analysis? Write the impact of node numbering on the band width calculations with examples.	CO4 - U	(16)
15.	(a)	Discuss about problems with material nonlinearity and explain about solution methods for such problems.	CO5 - U	(16)
		Or		
	(b)	What is dynamic condensation or reduction? Discuss the Guyan reduction method of dynamic condensation.	CO5 - U	(16)