E **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 51P02

M.E. DEGREE EXAMINATION, NOV 2018

First Semester

CAD / CAM

15PCD102 - ADVANCED FINITE ELEMENT ANALYSIS

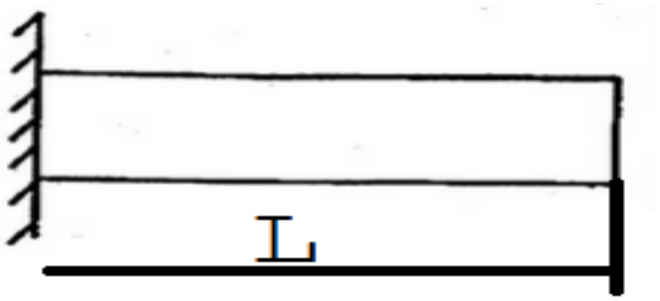
(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

1.	(a)	Develop the characteristic equations for the one dimensional bar element by using piece-wise defined interpolations and weak form of the weighted residual method.	CO1- App	(20)
		Or		
	(b)	A simply supported beam carries uniformly distributed load over the entire span. Calculate the bending moment and deflection. Assume EI is constant and compare the results with other solution.	CO1- App	(20)
2.	(a)	Axial load of 500N is applied to a stepped shaft, at the interface of two bars. The ends are fixed. Calculate the nodal displacement and stress when the element is subjected to all in temperature of 100°C. Take E1 = 30 x103 N/mm2&E2 = 200 x 103 N/mm2, A1=900 mm2 & A2 = 1200mm2, α1 = 23x10-6 /°C & α2 = 11.7x10-6/°C, L1=200mm & L2 =300mm.	CO2 -App	(20)
		Or		
	(b)	Find the natural frequencies of transverse vibrations of the cantilever beam shown in figure by applying one 1D beam element	CO2- App	(20)



3.	(a)	The (x, y) coordinate of nodes i, j, and k of triangular elements are given by (0, 0), (3, 0) and (1.5, 4) mm respectively. Evaluate the shape functions N1, N2 and N3 at an interior point P (2, 2.5) mm for the element. For the same triangular element, obtain the strain-displacement relation matrix B.	CO3-App	(20)
		Or		
	(b)	Develop Stress-Strain relationship matrix for axisymmetric triangular element.	CO3-App	(20)
4.	(a)	The temperature at the four corners of a four-noded rectangle arte T1, T2, T3 and T4. Determine the consistent load vector for a 2D analysis, aimed to determine the thermal stresses.	CO4- App	(20)
		Or		
	(b)	A wall of 0.6 m thickness having thermal conductivity of 1.2 W/mK. The wall is to be insulated with a material of thickness 0.06 m having an average thermal conductivity of 0.3 W/mK. The inner surface temperature is 1000 and outside of the insulated is exposed to atmospheric air at 30 with heat transfer coefficient of 35 W/m2K. Calculate the nodal temperatures.	CO4- App	(20)
5.	(a)	Briefly explain pre-processing of ANSYS fluent software.	CO5- U	(20)
		Or		
	(b)	Explain in details boundary condition implementation on ANSYS software package.	CO5- U	(20)