PRN:		Course Code:	PSE201

M. Tech (Civil-Structural Engineering) End Semester Examination Winter 2024

Finite Element Method 000419

Day and Date: Sat 30 NOV 2024 Max Marks: **100**

Time: 02:00PM To 06:00PM Duration: **04** hrs

Instructions:1) All questions Compulsory.
2) Figure to the right indicate full mark.
3) Draw sketches wherever necessary.
4) Assume suitable data if require

		Marks	Blooms level	CO
Q.1	**Solve any one of following.**			
a	Determine the nodal displacement at node 2 and support reactions in composite bar due to applied force P=400kN,as shown in fig. 1. Take area of Al. bar =2400 mm^2, E_{Al} =0.5X10^5N/mm^2, area of steel bar =1200 mm^2, E_s= 2X10^5N/mm^2	**16**	**L3**	**1**

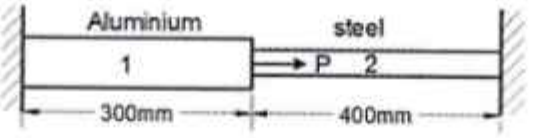
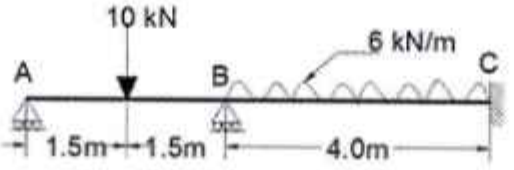


Fig.1

b	Analyze the beam loaded and supported as shown in fig.2, using finite element method.	**16**	**L3**	**1**



EI= Constant

Fig.2

Q.2	**Solve any two of following.**			
a	Derive shape function for 8-noded rectangular serendipity element in natural coordinate system.	**09**	**L2**	**2**

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	b	Explain the convergence and compatibility requirement for a finite displacement model.	09	L2	2
	c	Explain concept of plane stress and plane strain. Derive [k] for CST Element.	09	L2	2
Q.3		**Solve any two of following.**			
	a	What is Axisymetric problem? Explain procedure to formulate [k] for any one axisymmetric element.	09	L2	3
	b	Derive [k] for tetrahedral element.	09	L2	3
	c	Derive element stiffness matrix [k] for triangular ring element.	09	L2	3
Q.4		**Solve the following.**			
	a	Evaluate the integral $I=\int_{-1}^{1}(2x^3+5x^2+6)\,dx$ using two Gauss points	08	L4	3
	b	Explain natural coordinate system. How will you relate it with Cartesian coordinate system? Explain with help of example.	08	L2	3
Q.5		**Solve any one of the following.**			
	a	Describe in brief the various types of plate elements used in plate bending analysis.	16	L2	4
	b	Discuss ACM element and write down detailed procedure to obtain [k] for ACM element.	16	L2	4
Q.6		**Solve any one of following.**			
	a	State Hamilton's principle for Linear elastic body. Explain with suitable example how the consistent mass matrix is formulated by using Hamilton's principle	16	L2	4
	b	Determine consistent mass matrix and lumped mass matrix for axial vibration of a uniform bar finite element with 3 nodes and quadratic displacement.	16	L2	4

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