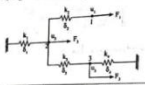
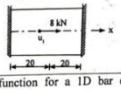
K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109
DEPARTMENT OF MECHANICAL ENGINEERING
SESSION: 2022-2023 (EVEN SEMESTER)
I SESSIONAL TEST QUESTION PAPER

SET-A

USN

Degree	: B.E	**Semester**	: VI
Branch	: Mechanical Engineering	**Date**	: 19-4-2023
Course Title	: Finite Element Method	**Course Code**	: 18ME61
Duration	: 90 Minutes	**Max Marks**	: 30

Note: Answer ONE full question from each part

Q. No.	Question	Marks	K Level	CO mapping
	PART-A			
1(a)	**Explain** the basic steps of FEM	5	K2 Understanding	CO1
(b)	Using the principle of minimum Potential Energy, **Determine** the displacements at the nodes for a spring system shown in figure. Take k_1 = 40N/m, k_2 = 60N/m, k_3 = 80N/m and k_4 = 100N/m, F_1 = 60N, F_2 = 80N and F_3 = 40N 	5	K3 Applying	CO1
(c)	**Derive** the shape function for a quadratic bar element	5	K3 Applying	CO2
	OR			
2(a)	**Explain** the Node numbering scheme	5	K2 Understanding	CO1
(b)	Use RR method, **find** the stress at a mid point of a bar as shown in figure. Take E = 70 Gpa and A = 100 mm^2 	5	K3 Applying	CO1
(c)	**Derive** the shape function for a 1D bar element by global coordinate system	5	K3 Applying	CO2
	PART-B			
3(a)	**Describe** the Convergence requirements	5	K2 Understanding	CO1
(b)	A cantilever beam is subjected to UDL for entire span of intensity 'P_0' **Determine** the equation for maximum deflection RR Method	5	K3 Applying	CO1
(c)	**Derive** the shape function for cubic bar element	5	K3 Applying	CO2
	OR			
4(a)	**Explain** the variational principles in FEM	5	K2 Understanding	CO1
(b)	A cantilever beam is subjected to point load at its free end. **Detemine** the equation for maximum deflection by RR Method	5	K3 Applying	CO1
(c)	**Derive** the shape function for CST Element	5	K3 Applying	CO2

Course Incharge HOD IQAC- Coordinator Principal

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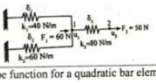
SET-B

USN

Degree	: B.E	**Semester**	: VI
Branch	: Mechanical Engineering	**Date**	: 19-4-2023
Course Title	: Finite Element Method	**Course Code**	: 18ME61
Duration	: 90 Minutes	**Max Marks**	: 30

Note: Answer ONE full question from each part

Q. No.	Question	Marks	K Level	CO mapping
	PART-A			
1(a)	**Explain** the Discretization Process	5	K2 Understanding	CO1
(b)	Using the principle of minimum Potential Energy, **Determine** the displacements at the nodes for a spring system shown in figure. 	5	K3 Applying	CO1
(c)	**Derive** the shape function for a quadratic bar element	5	K3 Applying	CO2
	OR			
2(a)	**Explain** Simplex, Complex and Multiplex Elements	5	K2 Understanding	CO1
(b)	Use RR method, **find** the displacement of a bar as shown in figure. Element 1 is made of Al and Element 2 is made of steel E_{Al} = 70 Gpa and A_{Al} = 900 mm^2 E_{Steel} = 200 Gpa and Steel = 1200 mm^2 and P = 10000 N 	5	K3 Applying	CO1
(c)	**Derive** the shape function for a 1D bar element by global coordinate system	5	K3 Applying	CO2
	PART-B			
3(a)	**Derive** the Potential energy function for 3D elastic body	5	K3 Applying	CO1
(b)	A Cantilever beam is subjected to UDL for entire span of intensity 'P_0' **Determine** the equation for maximum deflection RR Method	5	K3 Applying	CO1
(c)	**Derive** the shape function for CST Element	5	K3 Applying	CO2
	OR			
4(a)	**Define** Global and natural coordinate system and **derive** the relation between Cartesian and natural coordinate system	5	K3 Applying	CO1
(b)	A Cantilever beam is subjected to point load at its free end. **Determine** the equation for maximum deflection by RR Method	5	K3 Applying	CO1
(c)	**Derive** the shape function for cubic bar element	5	K3 Applying	CO2

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Sample CIE question papers