SRM VALLIAMMAI ENGINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203

DEPARTMENT OF CIVIL ENGINEERING

(M.E - STRUCTURAL ENGINEERING)

QUESTION BANK - 2019

II SEMESTER

1917203 - FINITE ELEMENT ANALYSIS OF STRUCTURES.

Regulation – 2019

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Prepared by

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DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

SUBJECT: 1917203 - FINITE ELEMENT ANALYSIS OF STRUCTURES

SEM / YEAR: II / FIRST

UNIT-1 INTRODUCTION

Approximate solutions of boundary value problems - Methods of weighted residuals, approximate solution using variation method, Modified Galerkin's method, Boundary conditions and general comments-continuity, compatibility, convergence aspects. Basic finite element concepts - Basic ideas in a finite element solution, General finite element solution procedure, Finite element equations using modified Galerkin's method.

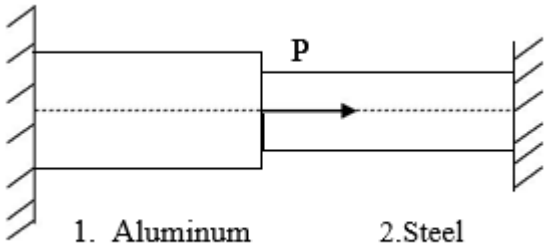
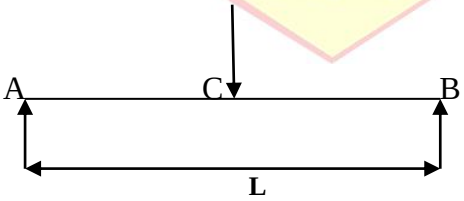
PART - A

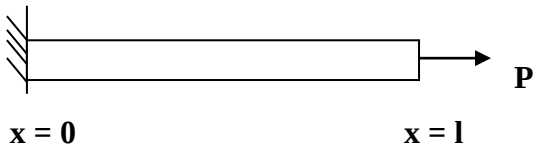
Q.No	Questions	BT	Competence
1.	State the methods of Engineering Analysis.	BT-2	**understand**
2.	Define Discretization and assemblage.	BT-6	**Creating**
3.	What is meant by finite element analysis?	BT-3	**Application**
4.	What do you mean by constitutive law?	BT-5	**Evaluate**
5.	Write the three phases of finite element method.	BT-4	**Analyze**
6.	What is a structural and non structural problems?	BT 5	**Evaluate**
7.	What are the methods are generally associated with the FEA?	BT-5	**Evaluate**
8.	Write the methods of weighed residual statement.	BT-2	**understand**
9.	During discretization, mention the places where it is necessary to place a	BT-4	**Analyze**
10.	Name any four FEA softwares.	BT 3	**Application**
11.	Differentiate between global and local axes.	BT 6	**Create**
12.	What are the limitations of Galerkin's formulation?	BT-2	**understand**
13.	State the condition must be fulfilled by the approximating function.	BT-3	**Application**
14.	How to analysis Degrees of freedom with examples?	BT 1	**Remember**
15.	What is Rayleigh Ritz Method?	BT-2	**Understand**
16.	What is the requirement of displacement field to be satisfied in the use of Rayleigh Ritz Method?	BT-1	**Remember**
17.	State the three phases of finite element method.	BT-3	**Application**
18.	Express the linear constitutive relations.	BT-6	**Creating**
19.	Draw the Pascal's triangle.	BT-1	**Remember**
20.	What is aspect ratio?	BT-1	**Remember**

PART – B

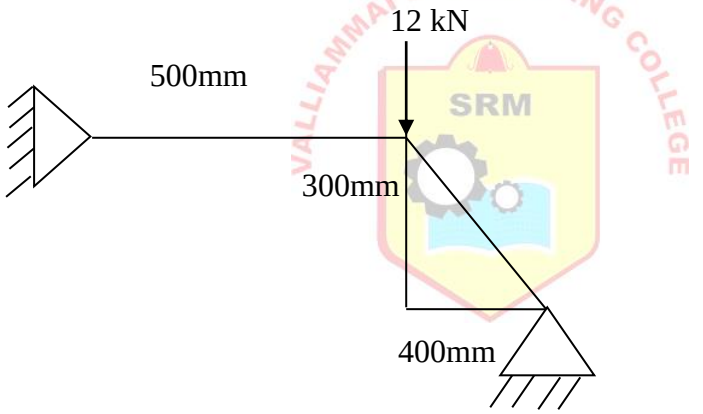
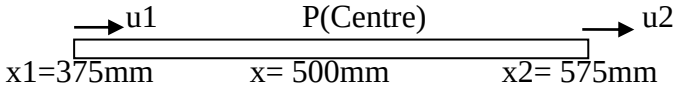
1.	The following differential equation is available for a physical phenomenon $AE(d^2y/dx^2+q_0) = 0$ with the boundary conditions $y(0) = 0$ $(dy/dx)_{x=L} = 0$. Find the value of f(x) using the weighed residual method.	BT-3	**Application**

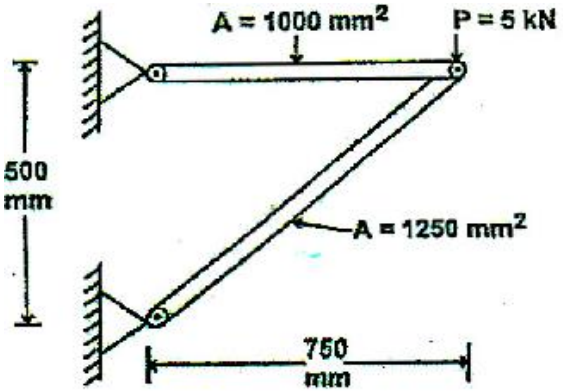
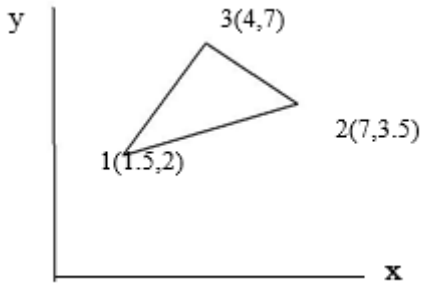
2.	Solve the following equations by Gauss elimination method? a) $2x_1+4x_2+2x_3 =15$ b) $2x_1+ x_2+2x_3=-5$ c) $4x_1+x_2-2x_3= 0$	BT 1	**Remember**
3.	A simply supported beam is subjected to uniformly distributed load over Entire span. Determine the bending moment and deflection at the mid span using Rayleigh –Ritz method and compare with exact solution. Use a two term Trial function $y=a_1\sin(\pi x/l) +a_2\sin(3\pi x/l)$.	BT-1	**Remember**
4.	The following differential equation is available for a physical phenomenon $(d^2y / dx^2) +50 = 0$, $0 \leq x \leq 10$. Trial function is $y = a_1 x (10-x)$. Boundary conditions are $y(0) = 0$; $y(10)=0$. Find the value of the parameter a1 by the following methods: 1) Point Collocation 2) Sub Domain 3) Least Square 4) Galerkin method.	BT-2	**Understand**
5.	The following differential equation is available for a physical phenomenon $(d^2y / dx^2) -10x^2=5$, $0 \leq x \leq 1$. Trial function is $N_1 = x (x-1)$ $N2 = x^2(x-1)$. Boundary conditions are $y(0) = 0$; $y(1)=0$. Find the value of the parameter a1 by the following methods: 1) Point Collocation 2) Sub Domain 3) Least Square 4) Galerkin method.	BT 1	**Remember**
6.	List out the advantages, disadvantages and applications of FEA.	BT 2	**Understand**
7.	Solve the following differential equation using Ritz method. $d^2y/dx^2 = -\sin(\pi x)$ boundary conditions $u(0) = 0$ and $u(1) = 0$.	BT-3	**Application**
8.	Discuss the concepts of FEA. List out the errors and accuracy in FEA.	BT-2	**Understand**
9.	A simply supported beam of span L, young's modulus, moment of inertia I is subjected to a uniformly distributed load of P/unit length. Determine the deflection W at the mid-span. Use Rayleigh Ritz method.	BT-6	**Creating**

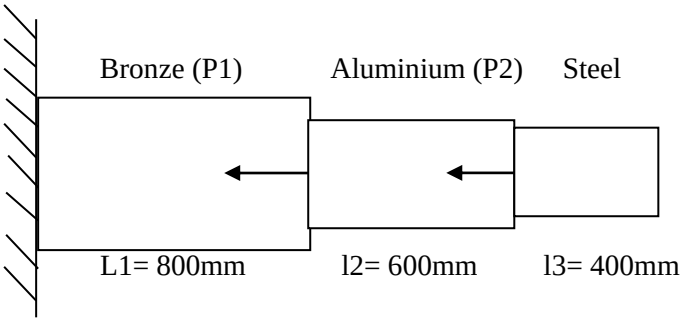
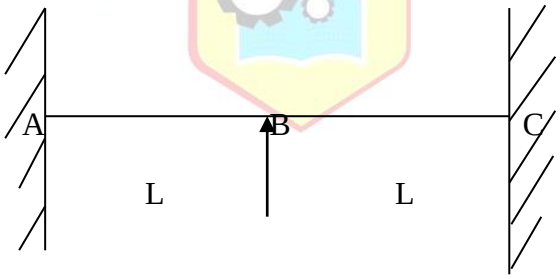
10.	For the bar shown in fig, evaluate the nodal displacement, stress in each Material and reaction forces. L1 = 300mm and L2 = 400mm. A1= 2400 mm^2, A2= 600mm^2, P= 200kN, E_1= 70GPa, E_2= 200GPa  	BT-5	**Evaluate**
11.	The following differential equation is available for a physical phenomenon (d^2y / dx^2) +500x^2 = 0, 0 ≤x≤1. Trial function is y = a_1 (x-x^4). Boundary conditions are y(0) = 0; y(1)=0. Find the value of the parameter a1 by the following methods: 1) Point Collocation 2) Sub Domain 3) Least Square 4) Galerkin method.	BT-2	**Understand**
12.	A simply supported beam subjected to uniformly distributed load over entire span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solution.	BT-1	**Remember**
13.	A beam AB of span 'l' simply supported at ends and carrying a concentrated load W at the centre 'C' as shown in fig. Determine the deflection at mid span by using Rayleigh-Ritz method and compare with exact solution.  	BT-4	**Analyze**
14.	A simply supported beam subjected to uniformly distributed load over entire span and it is subjected to a point load at the centre of the span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solution.	BT-4	**Analyze**
	PART – C		
1.	List and briefly describe the basic steps in finite element analysis.	BT-1	**Remember**
2.	3x+ y –z = 3 2x-8y +z = -5 x-2y+9z = 8. Solve the above equation using Gauss Elimination Method.	BT-2	**Understand**

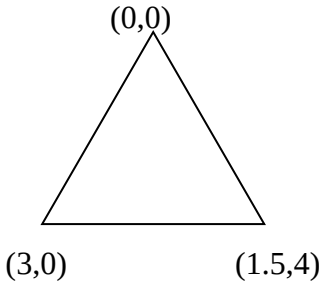
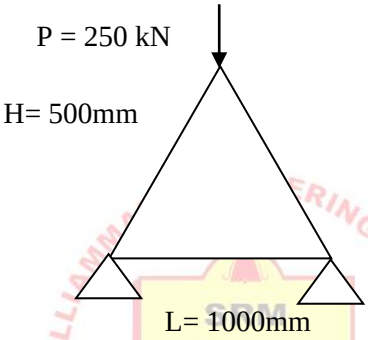
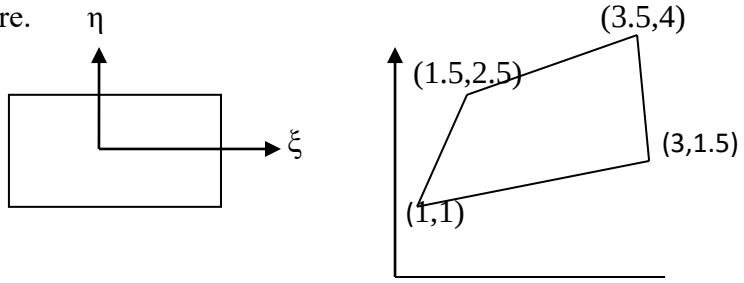
3.	A bar of uniform cross section is clamped at one end left free at the other end and it is subjected to a uniform axial load P as shown in fig. Calculate the displacement and stress in a bar by using two terms polynomial and three terms polynomial. Compare with exact solutions.  	BT-3	**Application**
4.	The differential equation of a physical phenomenon is given by $(d^2y/dx^2) + y = 4x$; $0 \le x \le 1$. The boundary conditions are: $y(0) = 0$ and $y(1) = 1$. Obtain one term approximation solution by using Galerkin's method of weighed residuals.	BT-6	**Creating**

UNIT-2 APPLICATION : AXIAL DEFORMATION OF BARS, AXIAL SPRING			
Natural Coordinates - Triangular Elements -Rectangular Elements - Lagrange and Serendipity Elements - Solid Elements - Isoparametric Formulation - Stiffness Matrix of Isoparametric Elements - Numerical Integration: One, Two and Three Dimensional - Examples.			
PART – A			
Q.No	**Questions**	**BT**	**Competence**
1.	How do you define two dimensional elements?	BT-2	**understand**
2.	Define 'Natural coordinate system'?	BT-1	**Remember**
3.	What are the types of loading acting on the structure?	BT 6	**Create**
4.	What is shape function? Also write the properties of shape functions.	BT-1	**Remember**
5.	Why polynomial are generally used as shape functions?	BT-1	**Remember**
6.	Write down the stress strain relationship matrix for plane stress condition.	BT-6	**Creating**
7.	How will u calculate the size of the global stiffness matrix?	BT-3	**Application**
8.	Write the shape function and displacement function for a 1D 2 noded	BT-3	**Application**
9.	Distinguish between essential boundary condition and natural boundary	BT-1	**Remember**
10.	What do you mean by isoparametric formulation?	BT-2	**understand**
11.	Write down the stress strain relationship matrix for plane stress condition.	BT-2	**understand**
12.	Write the stiffness matrix for the simple beam element given below.	BT-3	**Application**
13.	What do you mean by higher order elements?	BT-1	**Remember**
14.	What are the types of non-linearity in structural analysis?	BT-4	**Analyze**

15.	Write down the shape functions for four noded rectangular elements using natural coordinate system?	BT-4	**Analyze**
16.	Differentiate 2 Dimensional scalar variable and vector variable problems.	BT-5	**Evaluate**
17.	What is the purpose of isoparametric element?	BT-1	**Remember**
18.	Examine the properties of stiffness matrix?	BT-4	**Analyze**
19.	Write down the stiffness matrix equation for four noded isoparametric quadrilateral elements?	BT-2	**understand**
20.	What are the advantages of natural coordinates over global coordinates?	BT-1	**Remember**
	PART – B		
1.	Derive shape functions for a 2D rectangular element.	BT-1	**Remember**
2.	Derive the displacement function and shape function for one dimensional bar element based on global coordinate approach.	BT-5	**Evaluate**
3.	For the two bar truss shown in fig, determine the displacement of node 1 and stress in element 1-3. E = 70Gpa, A = 200mm2 	BT 1	**Remember**
4.	Consider a bar as shown in fig. C/s area of the bar is 750mm^2 and E= 2x10^{5}N/mm^2. If u1 = 0.5mm and u2 = 0.25mm, calculate the following: 1. Displacement at node P, 2. Strain, e 3. Stress σ, 4. Element stiffness Matrix K, 5. Strain Energy, U. 	BT 1	**Remember**

5.	The loading and other parameters for a two bar truss element is shown in fig. Determine 1) the element stiffness matrix for each element 2) Global Stiffness matrix 3) nodal displacements 4) reaction forces 5) the stresses induced in the elements. Assume E = 200GPa.  	BT 4	**Analyse**
6.	Evaluate the shape functions N1, N2, N3 at the interior point P (3.85, 4.8) for the triangular element shown in fig .  	BT-5	**Evaluate**

<table>
<tr><td>7.</td><td>A stepped bar shown in fig is subjected to an increase in temperature at 80^0C. Determine the displacements, stresses, and support reactions. Assume the following data:
<table><tr><td>Bronze</td><td>Aluminium</td><td>Steel</td></tr><tr><td>A= 2400 mm^2</td><td>1200 mm^2</td><td>600 mm^2</td></tr><tr><td>E = 83 Gpa</td><td>70 Gpa</td><td>200 Gpa</td></tr><tr><td>α= 18.9x$10^-6/^0$C</td><td>23x$10^-6/^0$C</td><td>11.7x$10^-6/^0$C</td></tr></table>  </td><td>BT 1</td><td>Remember</td></tr>
<tr><td>8.</td><td>A fixed beam of length 2L m carries a udl of w (N/m) which run over a length of L m from the fixed end as shown in Fig. Calculate the rotation at point B.  </td><td>BT-4</td><td>Analyze</td></tr>
<tr><td>9.</td><td>How to assemble the local stiffness matrix to global stiffness matrix.</td><td>BT-5</td><td>Evaluate</td></tr>
<tr><td>10.</td><td>Derive the shape functions for four noded bar element using Lagrangian interpolation function. Nodes are equally spaced.</td><td>BT 2</td><td>Understand</td></tr>
<tr><td>11.</td><td>Explain the isoparametric elements and its types.</td><td>BT 2</td><td>Understand</td></tr>
</table>

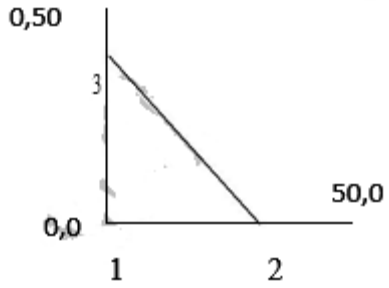
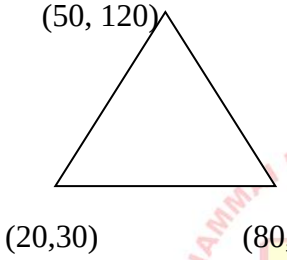
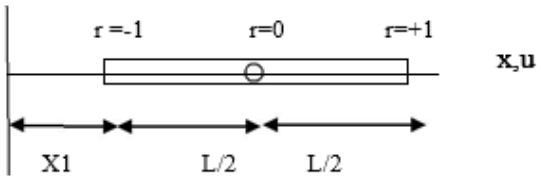
12.	The (x,y) coordinates of nodes i, j, k of a triangular element are given by (0,0), (3,0), (1.5,4) mm respectively. Evaluate the shape functions N1, N2, N3 at an interior point P (2, 2.5) mm for the element. Obtain the strain displacement relation matrix B.  	BT 5	**Evaluate**
13.	Consider the three bar truss element as shown in Fig. Take E = $2x10^5 N/mm^2$, calculate the nodal displacements. Take A1 = $2000mm^2$, A2 = $2500mm^2$, A3 = $2500mm^2$.  	BT-1	**Remember**
14.	Derive the stiffness matrix for one dimensional bar element.	BT-2	**understand**
	PART – C		
1.	Determine the Cartesian coordinate of the point P ($\xi = 0.8$, $\eta = 0.9$) as shown in figure.  	BT 4	**Analyse**
2.	Why higher order elements are needed? Determine the shape functions of an eight noded rectangular element.	BT-3	**Application**
3.	Derive the shape functions for two dimensional Lagrange and serendipity elements with examples?	BT-4	**Analyze**
4.	Discuss the generation of stiffness matrix and load vector for a beam element.	BT-2	**Understand**

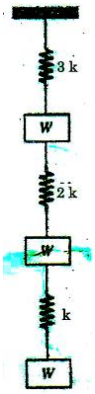
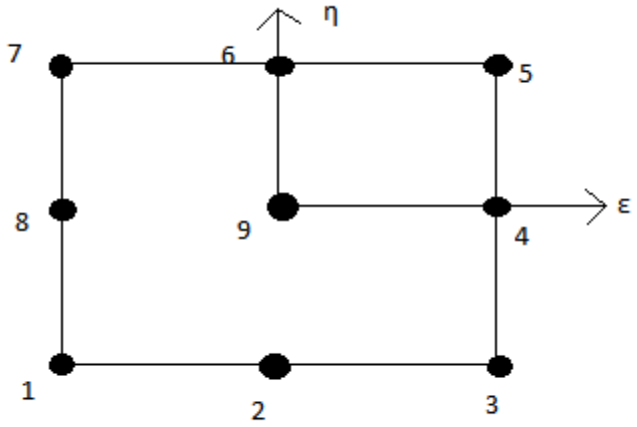
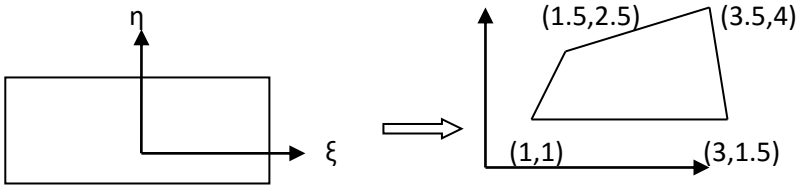
UNIT III ANALYSIS OF FRAMED STRUCTURES

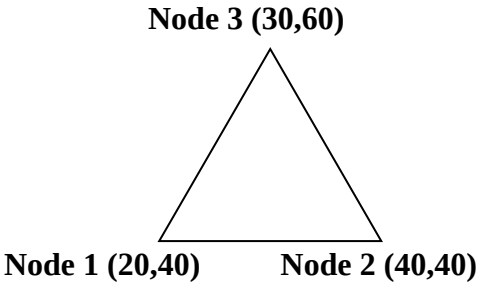
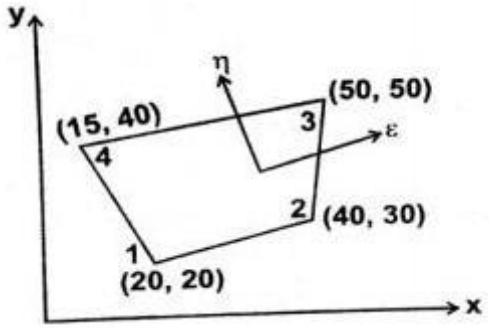
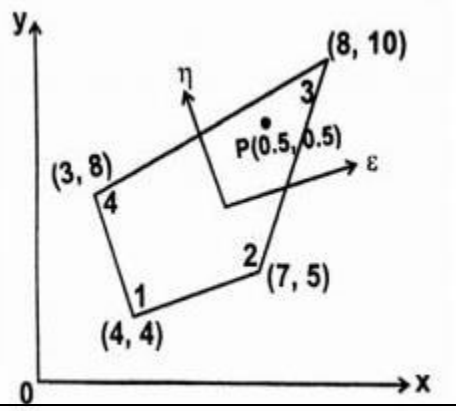
Stiffness of Truss Member - Analysis of Truss -Stiffness of Beam Member-Finite Element Analysis of Continuous Beam -Plane Frame Analysis -Analysis of Grid and Space Frame – Two Dimensional Solids - Constant Strain Triangle -Linear Strain Triangle -Rectangular Elements - Numerical Evaluation of Element Stiffness -Computation of Stresses, Geometric Nonlinearity and Static Condensation - Axisymmetric Element -Finite Element Formulation of Axisymmetric Element -Finite Element Formulation for 3 Dimensional Elements – Solution for simple frames.

PART – A

Q.No	Questions	BT Level	Competence
1.	State the conditions to be satisfied in order to use axisymmetric elements?	BT-5	**Evaluate**
2.	Explain the Jacobian transformation.	BT-1	**Remember**
3.	What is meant by an Isoparametric element?	BT-1	**Remember**
4.	Explain the Lagrange interpolation polynomials used for higher order elements.	BT-2	**understand**
5.	Differentiate between CST and LST	BT-1	**Remember**
6.	Show the stiffness matrix for an axisymmetric triangular element.	BT-4	**Analyze**
7.	Write a strain displacement matrix for CST element.	BT-4	**Analyze**
8.	Explain isoparametric elements?	BT-2	**understand**
9.	Write down the element force vector equation for 4 noded quadrilateral elements.	BT-4	**Analyze**
10.	What are the methods used for numerical integration in finite element method?	BT-6	**Creating**
11.	Why higher order elements are necessary?	BT-5	**Evaluate**
12.	Define load vector?	BT-6	**Creating**
13.	What is LST element?	BT-1	**Remember**
14.	What do you mean by higher order element? And why are they preferred?	BT-2	**understand**
15.	What is geometric isotropy?	BT-1	**Remember**
16.	In an element the geometry is defined using 4 nodes and the displacement is defined using 8 nodes. What is this element called?	BT-3	**Application**
17.	When Hermite interpolations functions are used?	BT-3	**Application**
18.	What are the ways in which 3D problem can be reduced to a 2D approach?	BT-3	**Application**
19.	Give four applications where axisymmetric elements can be used?	BT-2	**understand**
20.	Write down the displacement equation for an axisymmetric element?	BT-1	**Remember**

	PART – B		
1.	Determine the stiffness for the axisymmetric element shown in fig. Take E as 2.1 x 10^5 N/mm^2 and Poisson's ratio as 0.3.  	BT-3	**Application**
2.	Derive the stiffness matrix for the constant strain triangular element (CST) element shown in fig. the coordinates are given in units of millimeters. Assume plane stress conditions. Take E = 210GPa, υ = 0.25, t= 10mm.  	BT 6	**Create**
3.	Explain the Isoperimetric elements and its types.	BT-6	**Creating**
4.	Derive the displacement interpolation matrix, strain displacement interpolation matrix B, and Jacobian operator J for the three node truss element shown in Fig. Also sketch the interpolation functions.  	BT-3	**Application**

5.	Figure depicts a system of three linearly elastic springs supporting three equal weights W suspended in a vertical plane. Treating the springs as finite elements, determine the vertical displacement of each weight. 		
6.	Derive shape functions and stiffness matrix for a 2D rectangular element.	BT-1	**Remember**
7.	Derive the shape functions for element shown in fig. Shape functions should be specified in natural coordinate system.. 	BT-4	**Analyze**
8.	Calculate the Jacobian matrix and the strain displacement matrix for four node two dimensional quadrilateral elements corresponding to the gauss point (0.57735, 0.57735) as shown in Fig. 	BT-4	**Analyze**

9.	1 Evaluate $\int (x^4 + x^2)\, dx$ by applying 3 point Gaussian quadrature.		
10.	**The nodal coordinates for an axisymmetric triangular element are given below: (r1, r2, r3) as (20, 40, 30) and (z1, z2, z3) are (40, 40, 60) mm respectively. Evaluate strain displacement [B] matrix for that element.**  	BT-2	understand
	For the four noded quadrilateral element shown in fig determine the Jacobian and evaluate its value at the point (1/2, ½)  	BT-2	**understand**
11.	Explain in detail about the potential energy approach and Galerkin's approach.	BT-5	**Evaluate**
12.	Evaluate the Jacobian matrix at the local coordinates ε=η= 0.5 for the linear quadrilateral element with its global coordinates as shown in fig. Also evaluate the strain-displacement matrix.  	BT-1	**Remember**

13.	Derive the strain-displacement matrix for CST element.	BT-4	**Analyse**
14.	Derive the expression for stress-strain relationship matrix for 2D element.	BT-1	**Remember**
	PART – C		
1.	Consider the eight noded quadrilateral element defined by the following nodal coordinayes: x1 =5, y1= 7, x2= 1, y2=4, x3=2, y3= 1, x4=8 ,y4= 4, x5= 3, y5= 3, x6= 6, y6 = 5, x7 = 2.5, y7 = 3, x8= 1.5, y8 = 2. Determine the global coordinates $\eta = 1$, $\varepsilon = 0.75$.	BT-3	**Application**
2.	Explain with an example of each of the following a. Sub parametric element b. Iso parametric element c. Super parametric element	BT-6	**Creating**
3.	Explain in details for the finite element formulation.	BT-4	**Analyze**
4.	Evaluate the integral $\int$ (x4+x2) dx by applying 3 point Gaussian quadrature.	BT-2	**understand**

UNIT IV PLATES AND SHELLS

Introduction to Plate Bending Problems - Finite Element Analysis of Thin Plate -Finite Element Analysis of Thick Plate -Finite Element Analysis of Skew Plate - Introduction to Finite Strip Method -Finite Element Analysis of Shell.

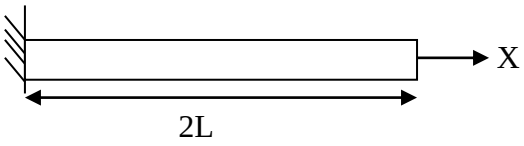
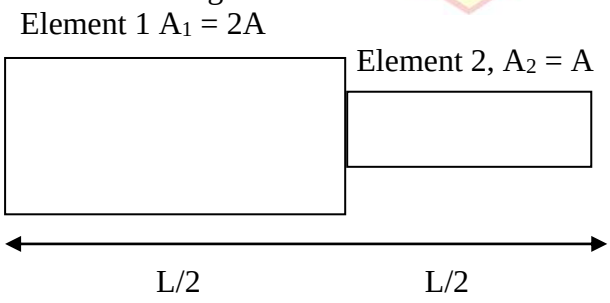
PART - A

Q.No	Questions	BT Level	Competence
1.	What is a plate element?	BT 1	**Remember**
2.	What are the advantages of shell element?	BT 1	**Remember**
3.	Write any two boundary conditions for thick plate theory.	BT 1	**Remember**
4.	What are the three categories of displacement models for plate analysis?	BT 1	**Remember**
5.	Write the basic relationships of thin plate element.	BT 2	**understand**
6.	Write the advantages of finite strip method.	BT 2	**understand**
7.	What are the assumptions for thin shell theory?	BT 2	**understand**
8.	Write the theory of kirchhoff plate element.	BT 2	**understand**
9.	Differentiate thin and thick plates.	BT 3	**Application**
10.	Define shell. Write the types of shells.	BT 3	**Application**
11.	Differentiate the structural behaviour of plates and shells.	BT 3	**Application**
12.	Define shell element,	BT 4	**Analyze**
13.	What are the assumptions of Reissner Mindlin Thick Plate theory? Also draw the bending diagram.	BT 4	**Analyze**

14.	What are the three assumptions used to reduce the equations of three dimensional theory of elasticity to two dimensions in thin plate theory.	BT 4	**Analyze**
15.	Draw the kirchoff plate after bending.	BT 4	**Analyze**
16.	What are the boundary conditions need to satisfy along the direction of the plate for various boundaries.	BT 5	**Evaluate**
17.	Write down the general solution for the finite strip method.	BT 5	**Evaluate**
18.	List out the advantages of shell elements.	BT 5	**Evaluate**
19.	Write down the jacobian matrix for eight noded shell elements.	BT 6	**Creating**
20.	Write down the stress strain relationship for the shell element.	BT 6	**Creating**
PART – B			
1.	What do we need to change in the program when using 3-node elements (6 global DOF per node) compared with 4-node elements (6 global DOF per node)?	BT 1	**Remember**
2.	Explain the Kirchhoff's plate bending theory. What are the assumptions made?	BT 1	**Remember**
3.	Describe in details about the Reissner - Mindlin thick plate theory. Draw the bending of thick plate.	BT 2	**understand**
4.	Derive the element stiffness matrix and nodal load factor for triangular element with 9 DOF.	BT 2	**understand**
5.	Explain the Strain Displacement Relation of thick plate	BT 3	**Application**
6.	Explain in detail the finite element analysis of skew plate. Find the K Value.	BT 4	**Analyze**
7.	What is the general solution Finite strip Method and apply the boundary conditions for both end simply supported.	BT 1	**Remember**
8.	Explain Finite element plate Formulation by Gaussian quadrature method.	BT 4	**Analyze**
9.	Write down the Assumptions, classifications, and advantages of shell elements for thin shell theory	BT 2	**understand**
10.	Describe in detail the overview of shell finite elements.	BT 3	**Application**
11.	Explain Finite element shell Formulation of a degenerated 3D solid element.	BT 5	**Evaluate**
12.	Explain in detail the Jacobian Matrix for eight node shell element and element stiffness matrix..	BT 6	**Creating**
13.	Write down the assumptions of thin plate and thick plate theory.	BT 5	**Evaluate**
14.	Explain in detail how to find the stiffness matrix of the rectangular thin plate bending element analysis.	BT 6	**Creating**
PART-C			
1.	Explain in detail the basic relationships and consecutive equations of thin plate theory.	BT 1	**Remember**
2.	Describe the element stiffness matrix for thin plate theory.	BT 6	**Creating**
3.	Differentiate Thin Plate theory and thick plate theory with case study.	BT 2	**understand**

4.	Explain the finite element formulation using Four noded degenerated quadrilateral shell element.	BT 4	**Evaluate**

UNIT-5 APPLICATIONS			
Finite Elements for Elastic Stability - Dynamic Analysis - Nonlinear, Vibration and Thermal Problems - Meshing and Solution Problems - Modelling and analysis using recent softwares.			
PART - A			
Q. No	**Questions**	**BT Level**	**Competence**
1.	List out the meshing techniques?	BT-1	**Remember**
2.	Give two examples of geometric nonlinear problems?	BT-1	**Remember**
3.	List the sources of errors in finite element analysis.	BT-1	**Remember**
4.	List the methods used for evaluation of Eigen values and Eigen vectors.	BT-1	**Remember**
5.	What is meant by error evaluation in FEM?	BT-3	**Application**
6.	How is geometry nonlinearity taken care in finite element analysis?	BT-4	**Analyze**
7.	What do you mean by material non linearity?	BT-2	**understand**
8.	What is a mass index?	BT-2	**understand**
9.	Give examples of thermal analysis problems.	BT-1	**Remember**
10.	Explain normal modes?	BT-6	**Creating**
11.	What is the difference between h and p methods?	BT-3	**Application**
12.	What are serendipity elements?	BT-2	**understand**
13.	What is discretization error?	BT-2	**understand**
14.	Explain weak formulation?	BT-6	**Creating**
15.	How error is evaluated in finite element analysis?	BT-5	**Evaluate**
16.	What are the types of non-linearity?	BT-1	**Remember**
17.	Form the consistent and lumped mass matrix for a truss element. Length = 3m, Area = 20 x 10^{-4} m^2 and mass density = 2.5x104 kgm-3	BT-5	**Evaluate**
18.	When the equilibrium equations are established with respect to the deformed shape, then the system is analyzed as ---------- nonlinear one.	BT-4	**Analyze**
19.	What are the types of meshes?	BT-4	**Analyze**
20.	How the discretization error is evaluated?	BT-3	**Application**
PART – B			
1.	Explain the automatic mesh generation technique.	BT-2	**Understand**
2.	State the need for mesh refinement. Discuss the methods of mesh refinement.	BT-1	**Remember**
3.	Explain the Fundamentals of vibrations in dynamic analysis.	BT-2	**understand**

4.	For the bar as shown in fig with length 2L, modulus of elasticity E, mass density, cross sectional area A, determine the first two natural frequencies.  	BT-3	**Application**
5.	Explain the causes and effects of vibrations in dynamic analysis.	BT-6	**Creating**
6.	Explain 2D mesh generation methods.	BT-2	**understand**
7.	Discuss the types of vibrations in dynamic analysis.	BT-6	**Creating**
8.	What is adoptive meshing? Explain any one algorithm for auto meshing.	BT-3	**Application**
9.	Derive the equations of motion based on weak form.	BT-6	**Creating**
10.	Briefly explain about Convergence and its requirements	BT-3	**Application**
11.	Explain the Analysis Software based on the structure of a FEA program.	BT-2	**understand**
12.	Explain in detail about the structural analysis program with software packages.	BT-4	**Analyze**
13.	Differentiate conforming and non conforming element.	BT-5	**Evaluate**
14.	How will you calculate the consistent mass matrix for various elements?	BT-5	**Evaluate**
	PART – C		
1.	Explain Auto and Adaptive Mesh Generation Techniques.	BT-2	**understand**
2.	Briefly explain the history of Mesh Generation Techniques in Finite Element Analysis.	BT-5	**Evaluate**
3.	Find the natural frequency of longitudinal vibration of the unconstrained steeped bar as shown in fig.  	BT-2	**understand**
4.	Explain the methods of Finite element Model Generation.	BT-5	**Evaluate**