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AE8601 FINITE ELEMENT METHODS

IMPORTANT QUESTIONS AND QUESTION BANK

UNIT-I

2-Marks

1. Seven basic steps in Finite Element Method?
2. Define finite elements?
3. Define modeling?
4. What is Discretization?
5. Write elements connectivity table?
6. Define stiffness matrix?
7. Define Elimination method?
8. What is Penalty approach method?
9. Define Rayleigh-Ritz Method?
10. What is MPE principle?

Part-B

1. Explain and derive the Derivation of the governing equation using the MPE principle?
2. Discuss about the principle and function of Rayleigh-Ritz method?
3. Write a advantages and disadvantages of Rayleigh-Ritz method?
4. Explain about the Comparison of three approaches to deformation analysis?
5. Discuss and explain about the method of finite elements are used in various platforms give more details about it?
6. Explain about the working principle of Seven basic steps in Finite Element Method? Explain in each steps given below?
7. Write a short note on (i) stiffness matrix (ii) Assembly (iii) Application of BC's?
8. Explain the line segments of modulation and Discretization?
9. Explain about the single element in a natural coordinate system?
10. What are the boundary conditions are apply in stiffness matrix?
11. Explain about Elimination method and Penalty approach method?
12. Explain about Derivation of the governing differential equation of an axially loaded bar using the force-balance method?
13. Explain the method of Lumped-model?
14. Explain about the types of elements and give their function of the elements?
15. Explain in interpolation modules in (i) simplex (ii) complex (iii) multiplex? And linear interpolation polynomials in the terms of global co-ordinates 1D,2D,3D simplex elements?

UNIT-II SOLUTION OF 1-D BARS

2-Marks

1. Define Body force distribution?
2. What is the displacement function?
3. What is Surface force distribution?
4. derive the expression of surface force?
5. What are the Methods of handling boundary conditions?
6. Define Elimination Method?
7. What is Global load vector?
8. Define Element strain displacement matrix?
9. Define body force and surface force term?
10. Define Gauss Elimination Method?

Part-B

1. Explain about the Body force distribution for 2 node bar elements?
2. Discuss and explain about Surface force distribution for 2 node bar elements?
3. What are the method are using in Methods of handling boundary conditions?
4. Derive and explain about the Elimination Method?
5. Derive and explain about the Penalty approach method? Give an advantages and disadvantages?
6. Explain about the Quadratic 1D bar element?
7. Discuss about the function of Element strain displacement matrix?
8. Write a difference between body force and surface force term?
9. Derive the function of equilibrium equation KQ=F and how to solve the solving the matrix we have Q2, Q3 and Q4 values?
10. Explain about the Solution to Simultaneous Algebraic Equations – Gauss Elimination Method?
11. Explain in details about the Backward substitution?
12. Explain about the details of Gauss elimination method? And give their examples of technique?
13. Solve the following set of equation by Gaussian elimination technique 5x1 + 3x2 + 2x3 + x4 = 4 4x1 + 3x2 - 3x3 - 2x4 = 5 x1 + 2x2 - 2x3 + 3x4 = 6 - 4x1 + 3x2 – 5x3 + 2x4 = 7 solve it?
14. Explain about the function of higher order elements and give their details?
15. Derivation of Strain Displacement Equation and Stiffness Matrix for CST (derivation of [B] and [K])?
16. Explain about the analysis of trusses? And how to calculate How to calculate direction cosines?

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UNIT-III BEAMS AND SHAFTS

2-Marks

1. Define beam elements?
2. What is bending moment?
3. What is moment of inertia?
4. Write Strain energy in an element for a length dx?
5. Define linear beam elements?
6. Draw the any two graphs in variations of Hermite shape functions?
7. What is Uniformly distributed load?
8. Equation of Bending moment and shear force?
9. Define linear beam element?
10. Differentiative with nodal value and nodal slope?

Part-B

1. Explain in details about the beam elements?
2. Explain about the point of the most common type of structural component particularly in Civil and Mechanical Engineering?
3. Discuss about the derive for Potential energy approach?
4. Explain about the function of Hermite shape functions?
5. Write a graph the variations of Hermite shape functions and explain in it?
6. Once the shape functions are derived we can write the equation of the form stiffness matrix?
7. Explain about Beam element forces with its equivalent loads?
8. Write a short note in (i) load vector (ii) global load vector (iii) deflection vector?
9. determine stiffness matrix. Q1, Q2……Q8 be nodal displacements for the entire system and F1……F8 be nodal forces?
10. Determine the a beam subjected to system of forces and the deformation of the neutral axis?
11. Explain about the torsion of shafts? And finite elements formulation of shafts?
12. Determine the fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load (UDL)?
13. Explain the determination of the stress and twists in circular shafts?
14. Explain about in details with examples of cantilever beams?

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15. Determine the beam stiffness matrix based on Eular- Bernolli beam theory?

UNIT-IV HEAT TRANSFER

2-Marks

1. Define thermal strain?
2. Draw the initial strain variation of stress strain graph?
3. Define the thermal load vector?
4. Define load distribution?
5. Define elimination method?
6. Differentiate stress and strain?
7. Derive an equation of strain energy in a bar?
8. Why are called in thermal strain in initial strain?
9. Write an application of thermal conductivity in bar?
10. What is the difference in bar in elements?

Part-B

1. Determine the consider a bar of length L fixed at one end whose temperature is increased to ΔT as the explain in it?
2. Explain about the details in temperature effect on 1D bar element?
3. Determine the presence of this initial strain variation of stress strain graph and detailed explain it?
4. Why are the calculation of thermal load vector?
5. Explain and derive the effect of thermal load?
6. Discuss in Stress component because of thermal load?
7. Determine the expression of thermal load vector?
8. Difference between load factor and load vector?
9. What are the methods of calculation in thermal load distribution?
10. Differentiate the methods in elimination factor and load factor?
11. Explain about 1D finite element formulation using vibration method?
12. Discuss about the Flow through pipes of uniform and stepped sections?
13. Determine the flow through in hydraulic networks and briefly explain about it?
14. Explain about the basic equations of heat transfer?
15. Write a short note in (i) conduction (ii) convection (iii) radiation

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UNIT-V

2-Marks

1. Define point loads?
2. What is truss elements?
3. Define Axisymmetric solid elements?
4. What is numerical solution?
5. What are the application of bars?
6. What are the applications of stepped bars?
7. What are the application of beams?
8. Define beam elements?
9. Differentiate between beam elements and quadrilateral elements?
10. What is hydraulic properties of the pipe?

Part-B

1. Determine the Direct application of the finite element method involving a matrix solution?
2. Explain about the General Description of the finite element method?
3. Explain the details about the axisymmetric finite elements?
4. Determine the derivation of stiffness matrix of axisymmetric triangular elements subjected to surface forces?
5. Explain about the details in point loads?
6. Discuss about the methods of angular velocity and draw the velocity diagram?
7. Write a note on the pressure vessels?
8. Explain about the consideration of finite elements methods?
9. Discuss the formulation for point in mass and distributed masses?
10. Explain about the consistent element mass of the matrix of one dimensional bar elements?
11. Explain in details about the axisymmetric triangular elements/
12. Write a summery of points in (i) truss element (ii) quadrilateral elements?
13. Determine the considering to lumped mass matrix for bar elements?
14. Determine the evaluation of eigen values and eigen vectors?
15. Write a applications are in bars, stepped bars and beam? And explain about the detail in stress and strain diagram?