Exam Slot: A

06CE6012 **Reg Number.....**
Name.....

A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREE EXAMINATION,MAY/ JUNE 2019
SECOND SEMESTER

Computer Aided Structural Engineering (CE)

Advanced Finite Element Methods

Time: 3 Hrs **Maximum Marks:60**

PART A

Answer ALL Questions

1. a)Set up the potential energy functional for a truss element subjected to uniform axial load. (2.5)
   b)Write down the general procedure of FEA. (2.5)

2. a)Differentiate between C^0 and C^1 continuity (2.5)
   b)What is geometric invariance and why is it important in FEA? (2.5)

3. a)What is meant by static condensation? (2.5)
   b)Differentiate between subparametric, isoparametric and superparametric elements . (2.5)

4. Discuss the assumptions made in Mindlin′s theory of plates . (5)

4 x 5 marks = 20 marks

PART B

5. a)Distinguish between plane stress and plane strain problems. (3)
   b)A bar of uniform cross section is clamped firmly at two ends. It is subjected to a uniformly distributed axial load of q over its entire run.Calculate the displacement and stress in the bar by Rayleigh-Ritz method. (7)

OR

6. Find the deflection at the center of a simply supported beam of span length l subjected to uniform distributed load throughout its length using
   a)Point collocation method (5)
   b)Galerkin′s method. (5)

7. Derive the shape function for a four noded triangular element. (10)

OR

8. Derive the shape function for second order rectangular element . (10)

P.T.O

9. Derive the stiffness matrix for a beam element . (10)

OR

10. Differentiate between Lagrange and Serendipity Elements.Write down the finite element formulation of Lagrange element (10)

11. Discuss the stiffness matrix formulation of Love-Kirchhoff's plate bending element . (10)

OR

12. Determine the forces in each member. (10)

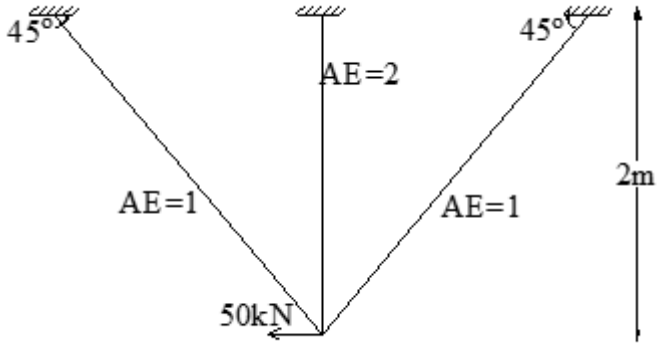

Figure 1: Truss

4 x 10 marks = 40 marks

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A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY
M.TECH DEGREE EXAMINATION, APRIL/MAY 2018
SECOND SEMESTER
COMPUTER AIDED STRUCTURAL ENGINEERING
ADVANCED FINITE ELEMENT METHODS

Time: 3 Hrs **Maximum Marks:60**

PART A

Answer ALL Questions

1. Briefly explain plane stress and plane strain conditions

2. Explain isoparametric element. What is meant by super parametric and sub parametric elements

3. What do you mean by static condensation

4. Explain Mindlin's plate bending theory

4 x 5 marks = 20 marks

PART B

5. Discuss the procedure for finite element analysis.

OR

6. Derive the governing equilibrium equations and boundary conditions of a given cantilever beam with UDL through out its length using variational approach

7. Explain the significance of compatibility and convergence criteria in a finite element analysis Problem. Explain each Criteria

OR

8. Derive the shape function for a CST element by area coordinates

9. Derive the stiffness matrix for a axisymmetric element

OR

10. Derive the stiffness matrix for a beam element

11. Analyse the given beam

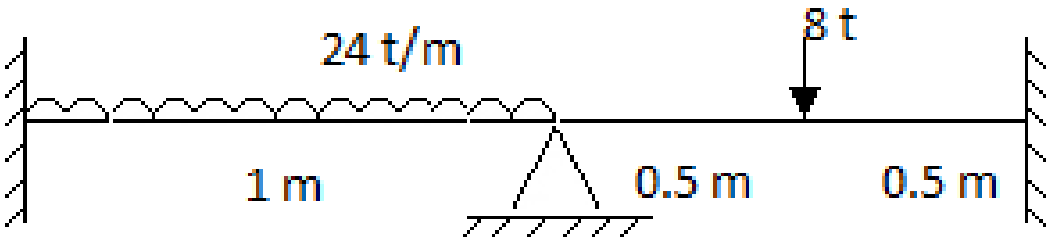

Figure 1: Continuos beam

OR

12. Discuss the stiffness matrix formulation of Love- Kirchhoff's plate bending element

4 x 10 marks = 40 marks

A

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A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION,APRIL/ MAY 2017

SECOND SEMESTER

Branch: M Tech. Computer Aided Structural Engineering

Advanced Finite Element Methods

Time: 3 Hours **Max. Marks: 60**

PART A

Answer ALL questions

1.

a. Discuss the minimization concept of total potential. Comment on stable and unstable equilibriums

b. Differentiate between plane stress and plane strain problems.

2.

a. Write short note on convergence criteria

b. Derive the shape function for a four noded triangular element

3.

a. Write short note on Lagrange and Serendipity elements

b. Evaluate $I = \int_0^1 e^{-x^2}$

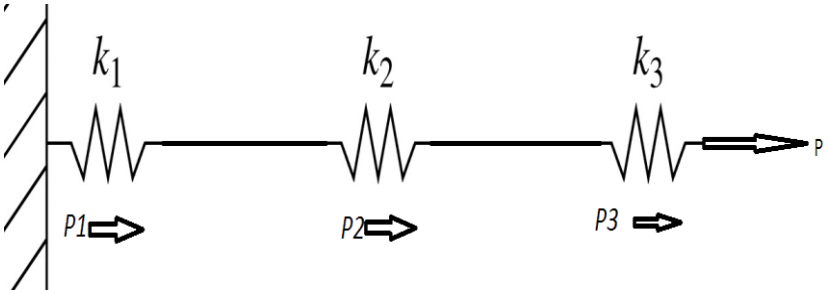
4. Compare the statements and limitations of plate bending theories.

(4 x 5 marks =20 marks)

PART B

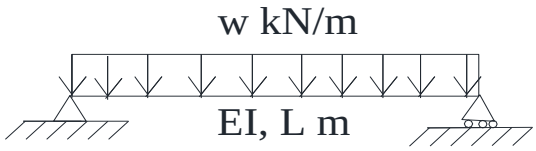
5.

a. Establish the equilibrium equation for a MDOF system **(3 Marks)**



P.T.O

b. Find the maximum deflection using Rayleigh Ritz method. **(7 Marks)**



OR

6.

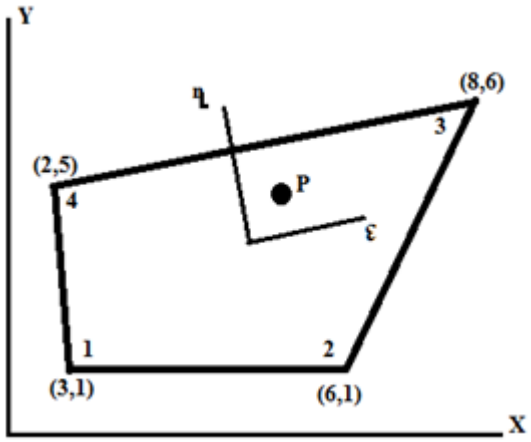
a. Explain variational principles **(3 Marks)**

b. A bar of uniform cross section is clamped at one end and left free at the other end. It is subjected to a uniformly distributed load of q over its entire run. Calculate the displacement and stress in the bar **(7 Marks)**

7.

a. Derive the shape function for a Q8 element. **(6 Marks)**

b. For the isoparametric quadrilateral element shown in figure, determine the local coordinates of the point P which has Cartesian co-ordinates (7, 4). **(4 Marks)**



OR

8.

a. Derive the shape function for a four noded spar element. **(5 Marks)**

b. Derive the shape function for a eight noded rectangular element. **(5 Marks)**

9.

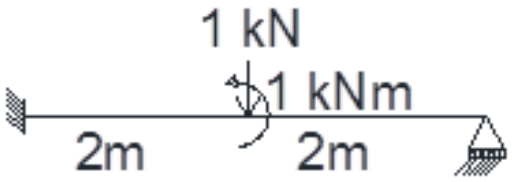
a. Explain static condensation **(3 Marks)**

b. Derive the stiffness matrix for a beam element **(7 Marks)**

OR

10. Derive the stiffness matrix for LST element. **(10 Marks)**

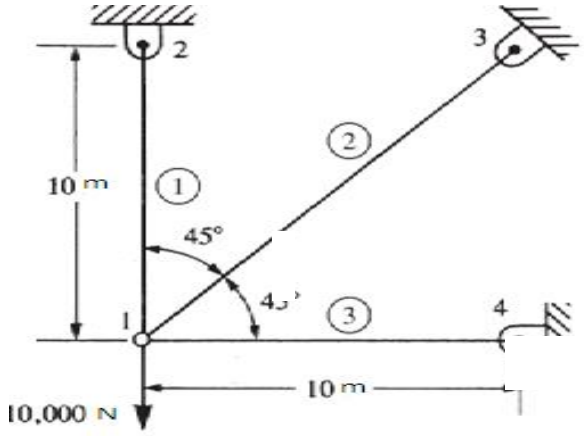
11. Determine the maximum displacement and rotation of the beam shown below.



(10 marks)

OR

12. Determine the displacement in x and y directions for the truss. Assume E = 210 GPa and A = 6 x 10^{-4} m^2 **(10 Marks)**



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A P J ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.TECH DEGREE EXAMINATION, MAY 2016

SECOND SEMESTER

Branch:Computer Aided Structural Engineering

ADVANCED FINITE ELEMENT METHODS

Time: 3 Hours **Max. Marks: 60**

PART A

Answer ALL questions

1. Explain plane stress and plane strain problems with examples.
2. Breifly describe Hermitian Interpolation method.
3. Explain Isoparametric elements.
4. Explain Love Kirchhoff's plate bending theory.

(4 x 5 marks =20 marks)

PART B

5. Explain the procedure involved in Finite Element Analysis. Discuss the merits and demerits of FEA over other methods.

OR

6. Illustrate the finite element form of Galerkin method in one dimension with an example.

7. Distinguish between Constant Strain Triangle and Linear Strain Triangle.
   Derive the shape function for a two noded beam element using generalised co-ordinate approach.

OR

8. Explain shape function and derive the shape function for a quadractic bar element using Lagrangian interpolation function. Nodes are equally spaced.

9. Derive the element stiffness matrix for a four noded isoparametric plane stress element.

OR

10. Write short notes on Gauss quadrature technique and Static Condensation.

11. Derive the element stiffness matrix for a typical Mindlin's plate bending element.

OR

12. Discuss the stiffness matrix formulation of Love-Kirchhoff 's plate bending element.

(4 x 10 marks =40 marks)