

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
III B.TECH II SEM-REGULAR/SUPPLEMENTARY EXAMINATIONS MAY - 2010
FINITE ELEMENT AND MODELLING METHODS
(AERONUTICAL ENGINEERING)

Time: 3hours

Max.Marks:80

Answer any FIVE questions
 All questions carry equal marks

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1. Write short notes on:
 - a. Stiffness
 - b. Flexibility
 - c. Inertia and Damping models
 - d. Transformable Linkages. [4 × 4]

- 2.a) Derive the expression for the area co-ordinates in natural co-ordinate systems with suitable example.
- b) Determine the value of $\int L_1^3 L_2^2 dA$ for entire area of 'A' for area co-ordinates. [12+4]

3. A composite wall consists of three layers of different material properties as shown in figure 1. The outer temperature is 20°C and convection heat transfer takes on inner surface of the wall. The surrounding temperature is 800°C and heat transfer coefficient, $h=25$ watts/ $\text{m}^2\text{-K}$.
 Take thermal conductivity
 $K_{2i}=30$ watts/ $\text{m-}^\circ\text{K}$
 $K_{3i}=50$ watts/ $\text{m-}^\circ\text{K}$.
 Find the temperature at the intersections of the slabs and determine the heat transmitted through the wall. [16]

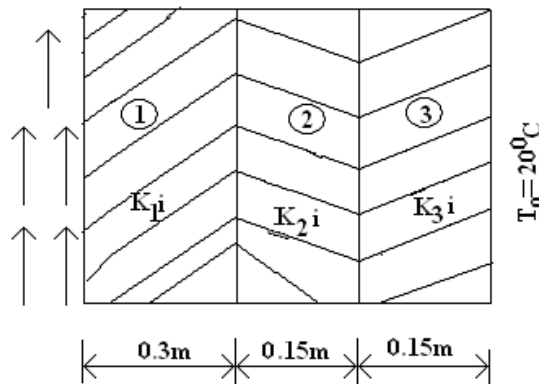


Figure 1

- 4.a) Explain which type of mass matrix gives more accurate natural frequencies.
- b) How is consistent mass matrix derived? A plate element has nodes at 1(0,0) 2(5,0) and 3(3,4) is of material with mass density 8 gms/cm^3 and thickness 1 cm. Derive its lumped mass matrix. [4+12]

- 5.a) Explain the nodal parametric representation of discrete domains with suitable examples.
b) Differentiate between isoperimetric, sub parametric and super parametric elements. [8+8]
- 6.a) Write in brief about Gauss quadrature method with an example.
b) Derive the abscissas and weights for the Gaussian quadrature formula when $n = 2$. Also check the two abscissa values with the roots of the second order Legendry polynomial equation. [8+8]
- 7.a) Describe the method to solve the cylinder subjected to internal pressure using axi-symmetric boundary conditions.
b) Derive the strain - displacement relation matrix for axi-symmetric triangular element. [8+8]
- 8.a) Explain the different modules that are existing in the NISA package and also the advantages over other packages.
b) What is multi level sub-structuring of mesh generation? Explain with suitable examples. [8+8]

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