R09

Code No: C1505

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY 2012
ADVANCED FINITE ELEMENT ANALYSIS
(MACHINE DESIGN)

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

Answer any five questions
All questions carry equal marks

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1. a) Explain how the weighted residual method is used for solving the beam element.
   b) Differentiate between plane stress and plane strain elements with two suitable examples and derive their elasticity matrices.

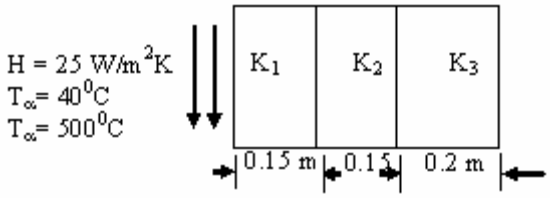
2. Derive the strain displacement relation matrix and stiffness matrix for 3-D tetrahedron element using displacement approach.

3. a) Derive C^0, C^1, C^2 continuity equations for the isoparametric elements and discuss the salient features.
   b) Derive the shape functions for eight noded quadrilateral element and draw their profiles.

4. A square plate of 400 cm X 400 cm is subjected a uniformly distributed load of 5.88 kN/m^2. The elastic constants used are $E = 2 \times 10^3$ kN/cm^2 and poisons ratio is 0.15. If the boundary is simply supported, then calculate the stresses developed in it.

5. a) What is the use of Orthogonal functions to derive the stiffness matrix of shells? Explain.
   b) Derive the shape functions for eight noded shell element and discuss the salient points.

6. a) Apply the Galerkin method for the steady state heat conduction equation and arrive general conductivty matrix and thermal load vector.
   b) Estimate the temperature distribution for the composite slab shown in the figure. The other face of the wall is subjected to heat flux of 400 W/m^2.
   K_1 = 25 W/m K; K_2 = 35 W/m K; K_3 = 25 W/m K



7. A long thick walled cylindrical pressure vessel of circular cross section with ID = 20 cm and OD = 40 cm is subjected to a temperature of 150^0C on the inside surface. Determine the temperature distribution in the cylinder thickness if the outside is exposed to ambient with h = 0.2 W/m^2K, $T_\alpha = 30^0$C. Take thermal conductivity of material as 40 W/mK.

8. Write short notes on:
   a) Transient heat conduction analysis
   b) Axisymmetric shells.

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