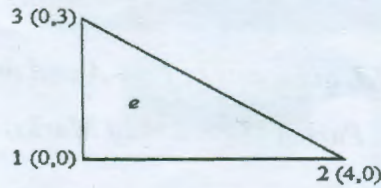
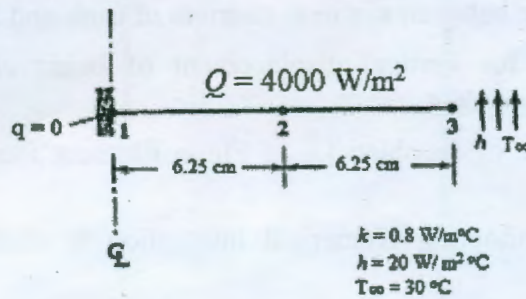




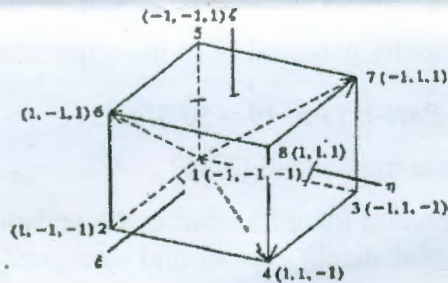
13. a) Describe the characteristics of 2D- iso-parametric element. [5]  
 b) A CST element is shown below. The element is subjected to a body force  $f = x^3 \text{ N/m}^3$ . [5]  
 Find the nodal force vector  $\{F\}$ . Take element thickness: 1



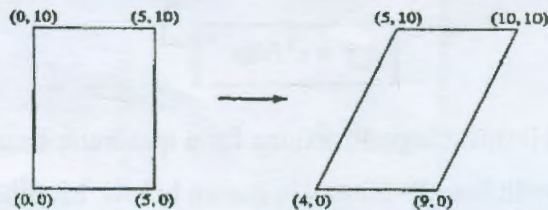
14. a) State the general boundary conditions imposed in heat transfer problems. [2]  
 b) Heat is generated in slab of 25 mm thickness. It is elementised with two linear 1D elements as shown in figure given below. One face is insulated and other face exposed to ambient. Determine nodal temperature vector. [8]



15. a) State strain –displacement relations in a thin metal plate under pure bending condition. [4]  
 b) Formulate the shape functions for a cube element shown below:  $Q = 4000 \text{ W/m}^2$  [6]



16. a) Determine the strains developed in elastic body when it is strained. The following figures [5]  
 show the undeformed and deformed shape of the body.



- b) Sketch beam Element with DOFs and derive Stiffness matrix. [5]  
 17. Answer any *two* of the following:  
 a) Derive material matrix  $[D]$  in Axisymmetric problems. [5]  
 b) Sketch possible mode shapes of an axial bar with fixed ends. Also determine its eigen value. Take Mass: 1Kg, Stiffness: 1kN/m. [5]  
 c) Describe the Finite Element formulation of 1D incompressible flow in small diameter tube. [5]