**Reg. No. \_\_\_\_\_\_\_\_**

**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examination - June 2011**

**Subject Title: FINITE ELEMENT METHODS IN ENGINEERING Time: 3 hours**

**Subject Code: 09CE309 Maximum Marks: 100**

**Answer ALL questions (5 x 20 = 100 Marks)**

1. **Compulsory**:

a. List and briefly describe the general procedure for finite element analysis. (8)

b. Explain the principle of virtual work. (12)

2. a. Explain the difference between isoparametric, subparametric and superparametric elements. (10)

b. Derive the stiffness matrix for a 3-D frame element. (10)

(OR)

3. a. Discuss how the stiffness matrix can be evaluated for isoparametric elements? (14)

b. Distinguish between Lagrangian and Serendipity family elements. (6)

4. a. Explain the one-point Gaussian Quadrature Method for the numerical integration with suitable example. (16)

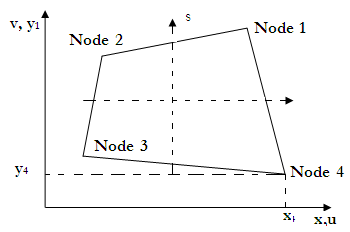
b. What are the approximations and errors associated in one point Gaussian Quadrature Formula? Explain. (4)

(OR)

5. a. Derive the shape function of a ZIB 8 element. (10)

b. Derive the stiffness matrix for 2-D axi-symmetric triangular element from the first principles. (10)

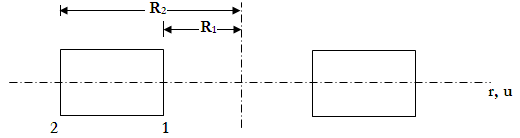
6. Derive the expression needed for the evaluation of the stiffness matrix of the isoparametric four node finite elements in Figure. Assume plane stress or plane strain conditions. Using the interpolation function h1, h2, h3 and h4.



(OR)

7. a. What are the difficulties are encountered in the development of flat plate and curved elements? (6)

b. Derive the shape functions and the element stiffness matrix for an axisymmetric annular ring element as shown in Figure. (14)



[P.T.O]

8. a. Develop the equations to be solved in a non linear transient heat transfer analysis using the Euler Backward Method and the Modified Newton Method. (12)

b. Write briefly about Load Deformation Response Methods. (8)

(OR)

9. a. Explain the methods of finite element model generation with suitable examples. (10)

b. Explain different basic approach to sub structuring technique. (10)