**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 ANALYSIS Time: 3 hours**

**Subject Code: 10ME302 Maximum Marks: 100**

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

1. **Compulsory**:

An aluminium fin of rectangular profile has base temperature 100oC and the atmospheric temperature around the fin is 20oC. The thermal conductivity of fin is 168 W/mo C and the convective heat transfer coefficient with surrounding air is 30 W/m2C. The size dimension of rectangular fin profile has 75mm length, 5mm wide and 1mm thickness. Determine the temperature distribution along the fin and also determine the heat loss from fin.

2. a. Neatly illustrate the steps involved in the finite element analysis. (10)

b. What are the types of engineering analysis in FEM? (10)

(OR)

3. Solve Ax =b with A matrix and each of b’s transpose matrix

, & 

4. Explain various functions and methods of interpolation polynomials.

(OR)

5. Use the Galerkin’s method to find the displacement at the midpoint of the rod shown in figure. Body force per unit volume ρg=1

x=0

x=2

E=1

A=1

g

x

6. Consider the bar in figure loaded as shown. Determine the nodal displacement, element stress and support reactions. E=200x109 N/m2

150mm

150mm

300mm

A1=250mm2

A2=400mm2

P=300kN

(OR)

[P.T.O]

7. The figure shown below is a four-bar truss having E = 0.203 x 106 N/mm2 and

Ae= 6.451cm2 for all elements.

a. Determine the element stiffness matrix for each element.

b. Assemble the structural stiffness matrix K for the entire truss.

c. Solve for the nodal displacement.

d. Recover the stress in each element.

e. Calculate the reaction forces

76.2cm

101.6 cm

1

2

3

4

2

4

3

1

11.339x103 kg

Q8

Q7

Q6

Q5

Q4

Q3

Q1

Q2

x

9.071x103 kg

8. Consider steady state heat conduction in an isotropic rectangular region of dimensions 3a by 2a. The origin of the x and y coordinates is taken at the lower left corner such that x is parallel to the side 3a and y is parallel to the side 2a. The boundaries x = 0 and y =0 are insulated, the boundary x = 3a is maintained at zero temperature, and the boundary y = 2a is maintained at a temperature T =ToCos(πx/6a). Determine the temperature distribution using finite element method through rectangular element and triangular element matrices and the heat required at the boundary x=3a to maintain it at zero temperature.

(OR)

9. Illustrate the development of finite element model in torsion of cylinder bars.