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



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

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

**End Semester Examination – Nov/Dec – 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **15AE3009** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Finite Element Analysis in Aerospace Application** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | Marks |
| 1. | a. | Write the engineering applications and advantages of FEM. | CO1 | 15 |
| b. | Write the properties of the Shape function. | CO1 | 5 |
| (OR) | | | | |
| 2. | a. | Derive the Shape function and Element Stiffness Matrix for 1-D Truss element. | CO1 | 20 |
| 3. | a. | Consider a bar as shown in figure. An axial load of 200 kN is applied at point P. Take A1 = 2400 mm2, E1 = 70 X 109 N/m2, A2 = 600 mm2, E2 = 200 X 109 N/m2. Calculate the following   1. The nodal displacement at point P. 2. Stress in each material. 3. Reaction force. | CO2 | 20 |
| (OR) | | | | |
| 4. | a. | A simply supported beam subjected to uniformly distributed load over entire span. Determine the Bending moment and deflection at midspan by using Rayleigh – Ritz method and compare with exact solutions. | CO2 | 20 |
| 5. | a. | Derive the shape function of Bilinear rectangular element in Local co-ordinate system (s,t). | CO1 | 20 |
| (OR) | | | | |
| 6. | a. | Derive the shape function of one dimensional Linear Quadratic element in Global coordinate system. | CO1 | 20 |
| 7. | a. | Evaluate the Cartesian co-ordinate of the point P which has local co-ordinates ε = 0.6 and η = 0.8 as shown if figure. | CO2 | 20 |
| (OR) | | | | |
| 8. | a. | For the plane stress element shown in figure, the nodal displacements are  U1 = 2.0 mm v1 = 1.0 mm  U2 = 0.5 mm v2 = 0.0 mm  U3 = 3.0 mm v3 = 1.0 mm    Determine the element stresses σx,σy, τxy, σ1 and σ2 and the principal angle θP. Let E= 210 GPa, ν = 0.25 and t = 10 mm. All co-ordinates are in millimeters. | CO2 | 20 |
|  | | **Compulsory:** |  |  |
| 9. | a. | A wall of 0.6 m thickness having a thermal conductivity of 1.2 W/mK. The wall is to be insulated with a material of thickness 0.06 m having an average thermal conductivity of 0.3 W/mK. The inner surface temperature is 10000C and outside of the insulation is exposed to atmospheric air at 300C with heat transfer coefficient of 35 W/m2K. Calculate the nodal Temperatures. | CO2 | 20 |

ALL THE BEST