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 :** | **14AE3002** | **Duration :** | **3hrs** |
| **Sub. Name :** | **Advanced Computational Fluid Dynamics** | **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. | Define substantial derivation. | CO1 | 3 |
| b. | Write down the conservative form of the continuity equation and explain the terms involved.. | CO 1 | 5 |
| c. | Derive the energy equation for a viscous flow in partial differential non-conservation form. | CO 1 | 12 |
| (OR) | | | | |
| 2. | a. | Define local derivative and convective derivative. | CO 1 | 5 |
| b. | What are the important applications of CFD in engineering? | CO 2 | 5 |
| c. | Derive the continuity equation in partial differential conservation form. | CO 1 | 10 |
| 3. | a. | Derive | CO 1 |  |
|  | b. | Consider the second order PDE    and boundary values are u (3) = 0 .009; u (7.5) = 0 .004  Divide the domain into five grid points. Discretize the above equation by finite difference method and calculate the values of u at three grid points and compare the results with analytical solution. | CO 2 | 15 |
| **(OR)** | | | | |
| 4. | a. | Consider the source free heat conduction in an insulated rod whose ends are maintained at constant temperatures of 100°C and 500°C respectively.Calculate the steady state temperature distribution in the rod. Thermal conductivity k=1000W/m.K, cross sectional area A is 0.001 m2. | CO 2 |  |
| 5. | a. | What is ADI (Alternating Direction Implicit) method? | CO 1 | **8** |
|  | b. | Explain in detail, the solution methodologies of Direct and iterative methods. | CO 1 | **12** |
| **(OR)** | | | | |
| 6. |  | Differenciate between explicit approach and implicit approach for the solution of diiference equation. Formulate the explicit form for 1D heat conduction equation. | CO 1 | 20  20 |
| 7. |  | Explain in detail about the different turbulence models used in CFD and also explain about its significance in real time practical problems. | CO 2 | 20 |
| **(OR)** | | | | |
| 8. | a. | What is the principle of ‘large eddy simulation’ approach? | CO 2 | **6** |
|  | b. | Describe the two equation turbulence model with the necessary transport equations. | CO 2 | 14 |
|  | | **Compulsory:** |  |  |
| 9. | a. | How the initial and boundary conditions are applied to the nozzle flow? | CO 2 | 10 |
|  | b. | Derive the continuity, momentum and energy equation for the supersonic flow over the flate . | CO 1 | 10 |

ALL THE BEST