Code No: 56070 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year II Semester Examinations, May - 2019
COMPUTATIONAL AERODYNAMICS
(Aeronautical Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
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1.a) Derive the momentum equation for a viscous flow on the basis of flow model of infinitesimally small fluid element moving with the fluid.
b) How Computational Fluid Dynamics is useful as a design tool? Illustrate with an example? [8+7]

2. Explain conservation and non-conservation forms of governing flow equations with illustrations from continuity equation. Comment on Integral versus differential form of the governing flow equations. [15]

3.a) How parabolic system provides a compromise between the elliptic and hyperbolic system.
b) Classify the quasi-linear partial differential equations by Cramers Rule method. [8+7]

4. Use the second-order accurate central difference approximation and the first-order forward difference approximation to evaluate $\frac{\partial e^x}{\partial x}$ at x= 1, a step size of $\Delta x = 0.1$ is to be employed. Recall that e = 2.71828. [15]

5.a) Discuss in detail the Cell centered and Cell vertex approaches in finite volume methods.
b) Define the Finite Volume Discretization. List out available numerical schemes for generalized formulations. [8+7]

6.a) Write a short note on principle of structured mesh generation.
b) What are the available structured grid generation techniques and explain the conformal mapping method. [8+7]

7.a) Discuss the aspects of Numerical dissipation and dispersion.
b) Explain the significance of Lax-Wendroff technique in Computational Fluid Dynamics [7+8]

8.a) Obtain an elliptic form of pressure-correction poisson equation using a semi implicit method.
b) Write a short note on following numerical procedures: [8+7]
i) SIMPLE
ii) SIMPLEC

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