BASE-005

B.Tech. (AEROSPACE)

Term-End Examination

December, 2013

BASE-005 : INTRODUCTION TO COMPUTATIONAL FLUID DYNAMICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any seven** questions. All questions carry **eqaul** marks. Use of scientific calculator is **permitted**.*

1. (a) What are the important applications of CFD in Engineering? **4**

   (b) Distinguish between conservative and non - conservative forms of fluid flow. **2**

   (c) Write down the conservative form of continuity equation and explain the terms involved. **4**

2. (a) List out advantages and limitations of panel method. **5**

   (b) Explain the difficulties of evaluating the influences of a panel at its own control point. **5**

3. (a) Define : **2x3=6**
   (i) Consistency
   (ii) Convergence
   (iii) Lax equivalence theorem

   (b) Elaborate the basic aspects of the finite difference equations. **4**

4. (a) Write down the second order central mixed finite difference expression for $\dfrac{\partial^2 u}{\partial x \partial y}$. 4

   (b) Discuss the need of upwind type discretization. 4

   (c) Name the important errors that commonly occur in numerical solutions. 2

5. (a) What is the importance of CFL condition? 4

   (b) State and explain the difference between explicit and implicit methods with suitable examples. 6

6. (a) What are the different categories of boundary conditions. Give example of each category. 5

   (b) Differentiate between structured and unstructured grids. 5

7. What is need for classification of PDE's and how do you classify second order PDE's? 10

8. Write down the elliptical, parabolic and hyperbolic partial differential equations as applicable to CFD. 10

9. Derive the continuity equation in differential form for incompressible flow. 10

10. What is the finite element method (FEM) ? Explain, why should one use it ? 10

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