

**B.Tech. (AEROSPACE)****Term-End Examination****December, 2012**

00885

**BASE-005 : INSTRUCTION TO COMPUTER PLAY  
DEVICE***Time : 3 hours**Maximum Marks : 70**Note : Attempt any seven questions. Use of calculator is permitted.*

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| 1. | Derive the differential equation for :   | 6 |
|    | (a) Un steady 1-D heat conduction. Also define the accurate solution and precise solution.     |   |
|    | (b) Discuss in brief the Lax Wendroff method and give it's stability criteria.                 | 4 |
| 2. | (a) Derive the energy equation for a viscous flow with heat transfer in non conservation form. | 5 |
|    | (b) Justify CFD as a Research tool. Write and explain the steps involved in CFD Process.       | 5 |
| 3. | (a) How the boundary conditions and initial conditions are applied to the Nozzle flow ?        | 7 |
|    | (b) Why the governing equations are to be transformed into non dimensional form ?              | 3 |

4. (a) Describe Mac Cormack multi step method. 4  
 (b) Consider the viscous flow of air over a flat plate variation in velocity with respect to  $y$  is given as :  $U = 1582 (1 - e^{-y/L})$ . where  $L = 1$  unit and  $\mu = 3.37 \times 10^{-7}$  slug/(ft.s).  $y$  is from 0 to 0.3 in the step's of 0.1. Find the percentage error in shear stress, involved in first order and second order difference compared to exact solution. 6
5. Draw and explain the Subsonic - Supersonic flow through the C-D nozzle and also show the variation in properties along the length of nozzle. 10
6. (a) Distinguish between the basic discretisation techniques. Derive the expression for 1st order forward, 1st order rearward and 2nd order central difference equation with respect to  $x$ . 5  
 (b) Explain the domain and boundaries for the solution of Parabolic equation in 2D. Also explain the steady boundary layer flow's over a body. 5
7. What is the difference between the Euler's model and Navier Stokes model of equations ? Write the generic form of Navier Stokes model. 10

8. Consider the irrotational, 2D, inviscid, steady flow of a compressible gas. The flow field is slightly perturbed from free stream like flow over a thin profile. Find the roots of equations involved in such kind of flow problem using Cramer's rule and Eigen Method. **10**
9. Differentiate between explicit approach and implicit approach for the solution of difference equations. Formulate the explicit form for 1-D heat conduction equation. With an example explain the concept of compressed grid. **10**
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