Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech. (ME) (Sem–2)

COMPUTATIONAL FLUID DYNAMICS

Subject Code : MTME-204

M.Code : 74980

Date of Examination : 02-06-2023

Time : 3 Hrs. Max. Marks : 100

INSTRUCTIONS TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT.**
2. **Each question carries TWENTY marks.**

1. Explain the steps involved in the process of Computational Fluid Dynamics (CFD). How CFD can be used as a design tool? Discuss some of the applications of CFD in engineering.

2. Derive the momentum equation for a viscous flow in integral form. Show that all the three conservation equations mass momentum and energy can be put in a single generic integral form.

3. Explain the elliptic, parabolic and hyperbolic partial differential equations as applicable to computational fluid dynamics.

4. a) Explain how to find a second-order-accurate finite-difference at the boundary using a polynomial approach with a suitable example.

   b) Distinguish between truncation error, round-off error and discretization error.

5. a) Describe in detail vortex panel method for numerical solution of lifting flow over arbitrary bodies.

   b) Explain finite volume method for one-dimensional steady state diffusion problems.

6. Consider the problem of steady-state heat conduction problem in a large plate with uniform heat generation. The faces of the wall A and B are maintained at constant temperatures. Given that, the thickness L = 2 cm, with constant thermal conductivity k = 5 W/m^2K. Find the set of algebraic equations in matrix form without solving the equations. The temperature at faces A and B are 100°C and 400°C, respectively. The heat generation value q = 500 kW/m^3 four grid points only. Also show the diagrammatic view of the discretization.

7. Explain, why do the results obtained through numerical methods differ from the exact solutions that are solved analytically? Elaborate the causes for this difference.

8. Write short notes on :

   a) SIMPLE Scheme

   b) Benefits and limitations of CFD software tools.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.