Download Anna University Questions, Syllabus, Notes @
www.AllAbtEngg.com

Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 53291

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Seventh/Eighth/Tenth Semester

Mechanical Engineering (Sandwich)

ME 6014 — COMPUTATIONAL FLUID DYNAMICS

(Common to Aeronautical Engineering/Manufacturing Engineering/Mechanical Engineering/Mechanical and Automation Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Why validation of CFD results are essential?

2. How are the fluid flow equations classified?

3. Write down the 2 dimensional steady state diffusion equation.

4. Differentiate first order accuracy and second order accuracy.

5. Compare the performance of quick scheme with central differencing scheme.

6. What is cell peclet number?

7. State the necessity for a staggered grid.

8. What is SIMPLE algorithm?

9. State the need of mesh refinement.

10. What is Reynolds decomposition?

www.AllAbtEngg.com www.PhotoShip.Net www.SmartPoet.net

Download Anna University Questions, Syllabus, Notes @
www.AllAbtEngg.com

PART B — (5 × 13 = 65 marks)

11. (a) Derive the momentum equation for three dimensional fluid flow.

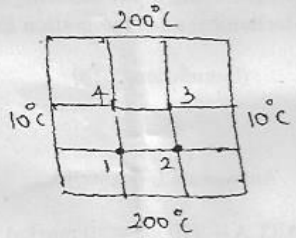
Or

(b) Discuss the mathematical behaviour of a hyperbolic equation with specific attention to steady in viscid supersonic flow.

12. (a) Explain how the explicit scheme can be applied to solve a one dimensional heat conduction equation.

Or

(b) Consider steady state heat conduction in a square region, subjected to the boundary conditions shown in figure. Use mesh size $\Delta x = \Delta y$ and determine the node temperatures indicated below by following the procedure of FDM.



13. (a) (i) Discuss the properties of discretization scheme. (7)

(ii) What do you mean by 'False diffusion'? Discuss in detail. (6)

Or

(b) Explain the Hybrid Differencing Scheme for multi dimensional convection diffusion problem. How is the power law scheme generated better results than the Hybrid scheme?

14. (a) Explain how can a staggered grid be used to evaluate scalar variables in the discretised momentum equation.

Or

(b) Explain about the PISO algorithm to solve steady state equation.

15. (a) Explain the Prandtl's mixing length model with its specific advantages and drawbacks.

Or

(b) Explain the key features of High Reynolds Number model and Low Reynolds Number.

www.AllAbtEngg.com www.PhotoShip.Net www.SmartPoet.net

Download Anna University Questions, Syllabus, Notes @
www.AllAbtEngg.com

PART C — (1 × 15 = 15 marks)

16. (a) A solid wall (K = 25 W/m.K) having thickness 0.1 m whose left side is well insulated and right side is subjected to 92°C. If heat generation internally as 0.3 MW/m^3 and assuming that it dimensions in y and z directions are so large that temperature gradients are significant in the x direction only. Calculate the steady state temperature distribution using FVM. Divide the domain into 5 equal sub domain.

Or

(b) Discuss the following :

(i) Adaptive mesh. (5)

(ii) Application of CFD in any 5 industry. (5)

(iii) Merits and demerits of CFD over experimental analysis. (5)

www.AllAbtEngg.com www.PhotoShip.Net www.SmartPoet.net