Reg. No.:.....

Name:.....

Eighth Semester B.Tech Degree Examination, 2017

(2013 Scheme) Model Question Paper

13.806.6 COMPUTATIONAL FLUID DYNAMICS (MPU) (Elective V)

Time: 3 hours Max. Marks: 100

Instructions:

a) All questions in part A are compulsory. All questions in part A carries 2 marks each.

b) Answer one full question from each module from Part-B. Each question carries 20 marks.

PART – A (10 x 2 =20)

1. Differentiate between structured and unstructured mesh.
2. Write down the governing equation for 1D conduction heat transfer, stating all assumptions.
3. List down the advantages of CFD over experimental methods.
4. How do you classify boundary conditions?
5. Explain the features of TDMA method?
6. What do you mean by cell centered finite volume discretization?
7. Explain the necessity of turbulence modeling?
8. What are the advantages and disadvantages of κ -ε model?
9. Pressure-velocity decoupling for incompressible flows?
10. What are the three stages of a CFD software?

PART - B

MODULE-I

11. (i) Explain the historical background of Computational Fluid Dynamics? (10)

    (ii) Explain the basic steps in CFD? (10)

OR

12. (i) What are the applications of CFD? (5)

(ii) Write down the governing equations of fluid flow, stating the assumptions in deriving the equation and then explain the significance of each term? (15)

MODULE-II

13. (i) Compare upwind, central and blended difference approximations for convection-diffusion problems. (15)

(ii) Explain the features of Crank-Nicolson scheme. (5)

OR

14. (i) What are the properties of discretization schemes? (5)

(ii) Consider the problem of source-free heat conduction in an insulated rod whose ends are maintained at constant temperatures of 100^{o}c and 500^{o}c respectively. Calculate the steady state temperature distribution in the rod. Thermal conductivity k equals 1000 W/m K and the cross-sectional area A is 10×10^{-3} m^2. (15)

Module-III

15. (i) Explain the features of (i) κ-ε turbulence model and (ii) κ-ω turbulence model. (12)

(ii) Explain the terms (i) Turbulent kinetic energy and (ii) dissipation. (8)

OR

16. (i) How are Reynolds average Navier stokes (RANS) equations formulated? (10)

(ii) Compare Large eddy Simulation and Direct Numerical Simulation models for turbulence. (10)

Module IV

17. (i) Explain SIMPLE algorithm. (10)

(ii) Explain a method for generating a stream line. (10)

OR

18 (i) Explain the benefits of using Total Variation Diminishing scheme for the discretisation of convective terms. (10)

(ii) Write notes on Commercial CFD packages (10)
