B.E. MECHANICAL ENGINEERING YHIRD YEAR 2nd SEM EXAMINATION 2016

ELEMENTS OF COMPUTATIONAL FLUID DYNAMICS

Time: 3 hours

Full Marks: 100

Answer any four questions

1. a) Explain with examples forward, rearward and central difference techniques. *8*

   b) Obtain the expression for the second order accurate finite difference discretization expression for $\partial^2 u/\partial x \partial y$ such that it is forward difference in x and rearward difference in y. *12*

   c) Briefly discuss the significance of CFD in the study of fluid mechanics and heat transfer. *5*

2. a) Explain the different sources of errors encountered while solving a discretized equation.

   b) What is the difference between implicit and explicit approaches in CFD analysis?

   c) Obtain the stability criterion of the one dimensional heat conduction equation by von Neumann stability method.. *7+6+12*

3. What do you mean by modified equation? Obtain the modified equation of 1-D wave equation. *5+20*

4. a) Discuss the characteristics of the predictor and corrector steps of the Maccormack technique. How is this method different from the Lax –Wendroff method ? *12*

   b) Discuss the relaxation technique and its use with low speed inviscid flow. *13*

5. a) What is the need for staggered grid ?

b) How is pressure correction introduced in finite difference method ?

c) Discuss the main features of the SIMPLE algorithm.

6+6+13