MASTER OF MECHANICAL ENGINEERING 2nd SEM EXAMINATION 2018

COMPUTATIONAL FLUID DYNAMICS

Time: 3 hours

Full Marks: 100

Answer any four questions

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

   b) Obtain the expression for the fourth order accurate central 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.

   c) Discuss briefly the advantages and disadvantages of higher order accuracy CFD analysis. *8+12+5*

2. a) What do you mean by stability of a difference equation?

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

   c) Obtain the CFL condition for a first order wave equation. *6+6+13*

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

4. a) Briefly discuss the effectiveness of Lax-Wendroff technique. How is this method used to solve time-marching problems on a Taylor series expansion in time? *8+7*

   b) Explain the different sources of errors encountered while solving a discretized equation. *10*

5. a) Discuss the relaxation technique and its use with low speed inviscid flow? *8*

   b) How is pressure correction introduced in finite difference method ? *7*

   c) Describe the various aspects and procedure used in the SIMPLE algorithm. *10*