

BACHELOR OF MECHANICAL ENGINEERING 3rd Year 2nd Semester Examination 2017

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.
b) Obtain the expression for the fourth order accurate central finite difference discretization expression for $\partial^2 u / \partial x^2$.
c) Discuss briefly the advantages and disadvantages of higher order accuracy in 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?
b) Distinguish between truncation error and round-off error ? 8+10+7
5. a) What is the need for staggered grid ?
b) How is pressure correction introduced in finite difference method ?
c) Describe the various aspects and procedure used in the SIMPLE algorithm.

6+6+13