Printed Pages: 02 **Sub Code: NCH011**

Paper Id: 151229 **Roll No.** | | | | | | | | | | |

B. TECH.

(SEM VI) THEORY EXAMINATION 2018-19

COMPUTATIONAL FLUID DYNAMICS

Time: 3 Hours ***Total Marks: 100***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

Define the following.

a) Incompressible fluid.
b) Importance of simulation
c) Computational fluid dynamics
d) Inviscid flow
e) Creeping flow
f) Flat plate boundary layer.
g) Unsteady state heat conduction
h) Reynolds stress equation model
i) Applications of CFD
j) Mixing length model

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a) What are the various methods of discretization. Discuss any one method.
b) Classify the different types of flows. Differentiate between potential flow and creeping flow.
c) State the advantages and disadvantages of explicit and implicit approaches.
d) What is the effect of turbulence on time averaged Navier-Stokes equations?
e) Explain the Law of conservation of mass and energy, with suitable examples

SECTION C

3. Attempt any *one* part of the following: **10x1=10**

a) Compare between Newtonian and Non-Newtonian Fluids with suitable examples.
b) Discuss the physical significance of Reynolds number. Differentiate between laminar to turbulent flow.

4. Attempt any *one* part of the following: **10x1=10**

a) Give the equations for dimensional unsteady state heat conduction. Mention the initial and final boundary conditions for this.
b) Discuss the applications of computational fluid dynamics with example.

5. Attempt any *one* part of the following: **10x1=10**

a) Write a short note on characteristics of simple turbulent flow.
b) Describe the flow in sudden pipe contraction or expansion.

6. Attempt any *one* part of the following: **10x1=10**

a) Define structured and unstructured grids. What are the modern developments in grid generations in solving the engineering problems?
b) Write a short note on the comparisons of analytical and numerical methods of solution.

7. Attempt any *one* part of the following: **10x1=10**

a) Discuss the flow and heat transfer in complex tubes and channels.
b) Derive second order accurate central one sided approximations for the three derivatives on a non-uniform grid.