

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III EXAMINATION – SUMMER 2025****Subject Code:3130502****Date:13-06-2025****Subject Name:Fluid Flow Operations****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) (i) specific gravity of a fluid and also mention its importance. **03**
 (ii) Define vena – contracta. (iii) Define cavitation in centrifugal pump.
 (b) Show that $P_X = P_Y = P_Z$ at a point within the static fluid. **04**
 (c) Derive an expression for head loss due to sudden expansion in flow area. **07**
- Q.2** (a) Explain effect of roughness. **03**
 (b) Explain in detail the behavior of Newtonian and non Newtonian fluid with suitable example. **04**
 (c) Define skin friction and form friction. Write down Bernoulli equation without friction and explain the correction of Bernoulli equation for fluid friction. **07**
- OR**
- (c) Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium. **07**
- Q.3** (a) Discuss in brief separation of boundary layers in diverging channel. **03**
 (b) Explain construction and working of a gate valve. **04**
 (c) Explain in detail about isentropic flow of compressible fluid through nozzle. **07**
- OR**
- Q.3** (a) Write significance of Mach number and acoustic velocity. **03**
 (b) Explain the concept of isothermal friction flow with diagram. **04**
 (c) Define NPSH. And also derive the equation of NPSH **07**
- Q.4** (a) What do you mean by subsonic, sonic and supersonic flows? **03**
 (b) Explain differences between fan, blower and compressor. **04**
 (c) Discuss with clear diagram construction and working of continuous gravity decanter. Derive equation for the height of the heavy liquid outlet above vessel bottom. **07**
- OR**
- Q.4** (a) Define friction and write short note on friction factor chart. **03**
 (b) Explain in brief drag and drag coefficient. **04**
 (c) What is hydraulically smooth pipe and also explain the importance of roughness parameter. **07**
- Q.5** (a) Give barometric equation with nomenclature. **03**
 (b) Explain asterisk condition and stagnation condition. Derive the expression for Stagnation temperature. **04**
 (c) Explain fully developed flow. Also discuss concept of transition length for laminar and turbulent flow. **07**
- OR**
- Q.5** (a) Write the significance of Mach number and acoustic velocity. **03**
 (b) Explain the Rayleigh method for dimensional analysis. **04**
 (c) With neat sketch, explain the principle and working of rotameter. **07**
