

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-IV Examination June- 2010****Subject code: 142101****Subject Name: Transport Phenomena in Materials Processing****Date: 17 / 06 /2010****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) (I) Define viscosity. By using Newton's law of viscosity derive Units of viscosity. **04**
(II) Describe Laminar and turbulent flow. **03**
(b) (I) Calculate the specific weight, density and specific gravity of one liter of liquid which weigh 7N. **04**
(II) Calculate the density, specific weight and weight of one liter of petrol of specific gravity 0.7. **03**
- Q.2** (a) Derive Bernoulli's equation from Euler's equation and explain its each terminology. **07**
(b) Derive an equation for incompressible fluid of constant viscosity flowing in laminar flow through the pipe. **07**
- OR**
- (b) By application of law of conservation of mass, derive an equation for Over all mass balance. **07**
- Q.3** (a) Using Newton's second law of motion, derive an equation of momentum balance. **07**
(b) Derive an expression for the terminal velocity of a solid sphere falling through a liquid assuming that stokes' law holds good for the system. **07**
- OR**
- Q.3** (a) Explain flow through fluidized bed. **07**
(b) Chalcopryrite copper ore of average particle diameter 0.01 cm is roasted in fluidized bed roaster at 550 °C. Calculate the minimum fluidization velocity, given that the densities of the ore and air are 4.5 gm/ cm³ and 0.0003 gm/ cm³ respectively and the viscosity of air is 0.04 centi Poise at 550 °C. **07**
- Q.4** (a) Derive equation for heat conduction through composite wall. **07**
(b) Explain Fourier law of heat conduction and define thermal conductivity (k). **07**
- OR**
- Q.4** (a) What is Convection? Differentiate between free and forced Convection. **07**
(b) Explain the term conduction, steady state conduction and unsteady state conduction. **07**
- Q.5** (a) In brief discuss black body radiation and Lambert's law. **07**
(b) Explain terms: Mass Density, Molar concentration and Mole fraction. **07**
- OR**
- Q.5** (a) Write note on pseudo steady diffusion. **07**
(b) Explain convective mass transfer in fluid at solid fluid interface. **07**