

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-IV(New) EXAMINATION – SUMMER 2016

Subject Code:2142105**Date:01/06/2016****Subject Name:Heat and Mass Transfer in Metallurgy****Time:10:30 AM to 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.

		MARKS
Q.1	Short Questions	14
	1 Viscosity of ideal fluid is	
	2 Density of water is	
	3 Viscosity of liquid _____ with temperature increase.	
	4 If Reynolds no is more 5678 than fluid flow is	
	5 Momentum balance equation is based on Newton's ____ law of motion.	
	6 Convection is mode of mass transfer. True or False	
	7 Heat conduction involve macroscopic flow of mass or material. True or False	
	8 If viscosity for a substance is infinite than it is	
	9 Radiative heat transfer can occur in any medium and without any medium.	
	10 Free convection require external agency for heat transfer. True or False	
	11 _____ have maximum emissive power.	
	12 Unit of specific gravity _____.	
	13 Discharge for a pipe having cross sectional area 10 cm ² and velocity 1 cm/sec is _____.	
	14 If potential energy of system is constant and pressure gradient is increased than it is converted in to _____.	
Q.2	(a) State Newton's law of viscosity and derive unit of viscosity.	03
	(b) Differentiate between free and force convection.	04
	(c) Describe different type of fluid flows.	07
	OR	
	(c) Derive Hagen-Poiseulle equation for fluid flowing through pipe.	07
Q.3	(a) If specific gravity of petrol is 0.7 than calculate its density and specific weight.	03
	(b) What is Fourier law of heat conduction? Derive unit for thermal conductivity.	04
	(c) Derive equation of differential mass balance.	07
	OR	
Q.3	(a) State Newton's law of cooling and derive unit for coefficient of convection (h).	03
	(b) State Fick's laws of diffusion and define diffusivity.	04
	(c) Derive differential momentum balance equation.	07
Q.4	(a) Explain terms: Molar concentration, Molar Fraction, Mass Fraction	03
	(b) State Euler's equation and derive Bernoulli's equation by integrating Euler's equation.	04

- (c) Derive general equation of heat conduction in rectangular coordinate system. **07**

OR

- Q.4** (a) Classify different type of fluid with example. **03**

- (b) Water is flowing with velocity 2.5 m/s in 30 cm diameter pipe which branches into two pipe of diameter 20 cm and 15 cm. Velocity of water in 20 cm diameter pipe is 2 m/s. Calculate Discharge in all three pipe and velocity in 15 cm diameter pipe. **04**

- (c) Derive generalized equation of mass transfer. **07**

- Q.5** (a) A hollow sphere is having inside and outside temperature 60°C and 25°C inside and outside radius 50 mm and 100 mm. Calculate thermal conductivity of sphere material if it is heated under steady state condition with heat flux of 50 W/m^2 . **03**

- (b) Briefly explain kirkindal effect. **04**

- (c) Derive equation for heat conduction through hollow composite cylindrical wall. **07**

OR

- Q.5** (a) How radiative heat transfer is different than conduction and convection? **03**

- (b) Explain Emissivity, Emissive power, gray body and white body. **04**

- (c) Derive equation of viscosity measurement by Stoke' method. **07**
