

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2018****Subject Code:2142105****Date:01/12/2018****Subject Name:Heat and Mass Transfer in Metallurgy****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.

- Q.1**
- (a) What is heat transfer? Why study of heat transfer is useful in metallurgical processes? **03**
- (b) State Newton's Law of Viscosity and classifies fluid. **04**
- (c) What do you mean by mass transfer? Explain different modes of mass transfer. **07**
- Q.2**
- (a) Differentiate between free and forced convection. **03**
- (b) State Fourier law of heat conduction and derive unit of conductivity. **04**
- (c) Derive general equation of heat conduction in rectangular coordinate system. **07**

OR

- (c) Derive Hagen-Poiseuille equation for incompressible fluid flowing laminar through pipe. **07**
- Q.3**
- (a) If specific gravity of petrol is 0.65 then calculate its density and specific weight. **03**
- (b) State Fick's laws of diffusion and define diffusivity. **04**
- (c) Derive differential momentum balance equation. **07**

OR

- Q.3**
- (a) How radiative heat transfer is different than conduction and convection? **03**
- (b) Water is flowing with velocity 3 m/s in 30 cm diameter pipe which branches into two pipe of diameter 25 cm and 15 cm. Velocity of water in 25 cm diameter pipe is 2.5 m/s. Calculate Discharge in all three pipe and velocity in 15 cm diameter pipe. **04**
- (c) Derive relation for heat transfer between two bodies by radiation. **07**
- Q.4**
- (a) Density of iron is 7.8 g/cc. Calculate its specific weight. **03**
- (b) Briefly explain kirkindal effect. **04**
- (c) Derive equation of viscosity measurement by stoke's method. **07**

OR

- Q.4**
- (a) Explain plank law for radiation. **03**
- (b) Explain Emissivity, Emissive power, gray body and white body. **04**
- (c) Derive generalized mass diffusion equation. **07**
- Q.5**
- (a) What is dimensionless analysis? **03**
- (b) Explain pseudo steady diffusion. **04**
- (c) Explain in terms of Radiation: absorptivity, reflectivity, emissivity and transmissivity. **07**

OR

- Q.5**
- (a) Briefly explain laws of diffusion. **03**
- (b) Give correlations of dimensionless numbers which play important role in natural & forced convections. **04**
- (c) Derive Bernoulli's equation by using Euler's equation. **07**
