Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– IV(NEW) EXAMINATION – SUMMER 2015

Subject Code: 2142105 **Date:**30/**05/2015**

Subject Name: Heat and Mass Transfer in Metallurgy

Time:10:30am-1.00pm **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? Write types of heat transfer. Why study of heat transfer is useful in metallurgical processes?	**07**
	(b)	What do you mean by mass transfer? Explain different modes of mass transfer	**07**
Q.2	**(a)**	State law of conservation of mass and derive equation of mass balance in three dimensions.	**07**
	(b)	Get Euler's equation from Navier stoke's equation and derive Bernoulli's equation from it.	**07**
		OR	
	(b)	Define fluid and viscosity. State Newton's law of viscosity, explain dynamic and kinematic viscosity and classify fluids	**07**
Q.3	**(a)**	Derive equation for heat conduction through composite wall.	**07**
	(b)	(i) Define convective heat transfer. Explain the difference between free & forced convection with examples.	**04**
		(ii) Give correlation of heat transfer coefficient with Nusselt number.	**03**
		OR	
Q.3	**(a)**	Derive equation for flow thorough fluidized bed.	**07**
	(b)	Explain following terms: i) Mass Density ii) Molar concentration iii) Mass Fraction iv) Mole Fraction	**07**
Q.4	**(a)**	Derive differential momentum balance equation.	**07**
	(b)	Write in brief about Wein's distribution law and Lambert's law	**07**
		OR	
Q.4	**(a)**	Explain Plank's Law, Kirchoff's and Stefan Boltzman Law.	**07**
	(b)	Explain in terms of Radiation: absorptivity, reflectivity, emissivity and transmissivity.	**07**
Q.5	**(a)**	Derive the equation for the viscosity measurement by stokes' method.	**07**
	(b)	What is Fourier law of heat conduction? Derive one dimensional heat conduction equation through a large plane wall.	**07**
		OR	
Q.5	**(a)**	What is newton's law of cooling ? Give correlations of dimensionless numbers which play important role in natural & forced convections	**07**
	(b)	Water is flowing through a pipe of 5cm diameter under a pressure of 29.43N/cm2 & with mean velocity 2 mt/sec. Find the total head/ total energy per unit wt of the water at a cross section, which is 5mt above the datum line.	**07**

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