Seat No.: _____ Enrolment No._____

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 force 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-Poiseulle equation for incompressible fluid flowing laminar through pipe.	**07**
Q.3	**(a)**	If specific gravity of petrol is 0.65 than 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' 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**

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