Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE SEMESTER IV • EXAMINATION – SUMMER 2015

Subject Code: 140403 **Date: 03/06/2015**

Subject Name: Principles of Process Engineering - I

Time: 10.30am-01.00pm **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)**	State different types of heat transfer and explain general laws of heat transfer for each mode.	**07**
	(b)	Derive the governing equation for unsteady state heat conduction with neat diagram.	**07**
Q.2	**(a)**	State and explain in detail Plank's law, Stefan-Boltzman law, Wein's displacement law and Kirchhoff's law for black body radiation.	**07**
	(b)	Derive equation of overall heat transfer coefficient U for the case of simultaneous conduction and convection heat transport in case of a plane wall.	**07**
		OR	
	(b)	What is thermal radiation? Explain the mechanism of radiation using different theories.	**07**
Q.3	**(a)**	Differentiate between Natural and Forced convection with examples of each.	**07**
	(b)	Define and give physical significance of Prandtl No., Nusselt No., Peclet No. and Grashoff No.	**07**
		OR	
Q.3	**(a)**	Describe with neat diagram Shell & tube heat exchanger with all its components involved.	**07**
	(b)	Derive the equation of LMTD for heat exchangers.	**07**
Q.4	**(a)**	State the methods of dimensional analysis and explain Rayleigh's method of dimensional analysis with suitable examples.	**07**
	(b)	Classify pressure measuring devices in detail and discuss any one with neat sketch.	**07**
		OR	
Q.4	**(a)**	Explain Newton's law of viscosity. Also give detailed classification of fluids based on this law.	**07**
	(b)	Explain cavitations and priming of a pump in detail.	**07**
Q.5	**(a)**	State different metering devices. Explain venturimeter or orificemeter in detail with neat sketch.	**07**
	(b)	Explain fluidization fundamentals and its industrial applications.	**07**
		OR	
Q.5	**(a)**	Derive an equation to find local velocity (u) as a function of radius (r) in a circular pipe.	**07**
	(b)	Explain Reynolds's No. and its significance along with Reynolds's experiment in detail.	**07**

****