Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – SUMMER • 2014

Subject Code: 140403 **Date: 23-06-2014**

Subject Name: Principles of Process Engineering-I

Time: 10:30 am - 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.**
4. **Notations used have their conventional meanings.**

Q.1	**(a)**	State different types of heat transfer and explain general laws of heat transfer for each mode.	**07**
	(b)	Explain the terms with respect to radiation: Absorptivity, Reflactivity, Transmitivity, Emissivity, Black body, Gray body and Monochromatic emissive power.	**07**
Q.2	**(a)**	With special reference to Fourier's law for heat conduction, derive the equation to calculate heat transfer rate in case of unidirectional steady state heat conduction through cylindrical wall made up of composite material.	**07**
	(b)	State and derive Stefan Boltzmann law of black body radiation using Planck's law.	**07**
		OR	
	(b)	Temperature distribution through a large wall of 50 cm thickness (c/s area = 10 m^2; k = 5.8 w/m-K; $\alpha = 0.02\ m^2/s$) is heated from one side at certain time t is found to be $T = 90 - 80x + 16x^2 + 32x^3 - 25x^4$; where T in K, x in m Calculate: i) The heat entering and leaving the wall in unit time. ii) Heat energy stored in wall per unit time. iii) The rate of temperature change with time at x = 0 and x = 0.5 m. iv) The location where the rate of heating is maximum.	**07**
Q.3		What is fluidization? Explain fluidization with a neat sketch. Describe the types of fluidization in detail along with its applications.	**14**
		OR	
Q.3	**(a)**	Explain the concept of Dimensional Analysis and its usefulness.	**07**
	(b)	Explain Reynolds's No. and its significance along with Reynolds's experiment in detail.	**07**
Q.4	**(a)**	Derive the equation of LMTD for heat exchangers.	**07**
	(b)	Explain different types of pump. Also, explain Centrifugal pump with neat sketch in detail.	**07**
		OR	
Q.4	**(a)**	Define NPSH and state its importance.	**04**
	(b)	Define the terms : (i) Manometric head (ii) Suction Head (iii) Manometric efficiency	**03**
	(c)	Explain velocity gradient and rate of shear with the help of graph for fluids.	**07**
Q.5		State different metering devices. Derive equation for venturimeter **or** orificemeter with neat sketch in detail.	**14**
		OR	
Q.5	**(a)**	Differentiate between Natural and Forced convection with examples of each.	**07**
	(b)	Explain cavitations and priming of a pump in detail.	**07**

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