Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (OLD) - EXAMINATION – SUMMER 2017

Subject Code: 140403 **Date: 08/06/2017**

Subject Name: Principles Of Process Engineering-I

Time: 10:30 AM to 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.**

Q.1	**(a)**	Derive Bernoulli's equation stating the assumptions and limitations involved in it.	**07**
	(b)	Explain Fourier's law for heat conduction in detail. Also apply it for the case of plane wall and composite wall with neat sketches.	**07**
Q.2	**(a)**	Starting from the definition of kinetic energy correction factor prove that $\alpha = 2$ for laminar flow of fluid in a circular pipe.	**07**
	(b)	Explain the concept of black body and its characteristics in brief. Also, state the laws of black body radiation and explain each in brief.	**07**
		OR	
	(b)	Determine the rate of heat flow through a boiler wall made of 20 mm thick steel (k = 58 W/mK). The outer surface of the boiler wall is covered with asbestos insulation (k = 0.116 W/mK), 5 mm thick. The temperature of outer surface and that of fluid inside are 50^0 C and 300^0 C respectively. The inner film resistance is 0.0023 m^2K/W.	**07**
Q.3	**(a)**	Define: (i) Potential flow (ii) Streamline tube (iii) Viscosity (iv) Laminar flow (v) Specific weight (vi) Newtonian fluid (vii) Incompressible fluid	**07**
	(b)	What are the different methods of dimensional analysis? Explain Buckingham –π method of dimensional analysis in detail.	**07**
		OR	
Q.3	**(a)**	Derive Hagen-Poiseuille equation for laminar flow of Newtonian fluids through pipes.	**07**
	(b)	Derive continuity equation in three dimensions.	**07**
Q.4	**(a)**	Explain the terms with respect to radiation: Absorptivity, Reflectivity, Transmitivity, Emissivity, Gray body, emissive power and Monochromatic emissive power.	**07**
	(b)	Describe with neat diagram Shell and Tube heat exchanger with all its components involved.	**07**
		OR	
Q.4	**(a)**	Derive the equation of LMTD for heat exchangers.	**07**
	(b)	Define NPSH and state its importance.	**07**
Q.5	**(a)**	Differentiate between Natural and Forced convection with examples of each	**07**
	(b)	Explain velocity gradient and rate of shear with the help of graph for fluids.	**07**
		OR	
Q.5	**(a)**	State and define different dimensionless numbers used in fluid flow and heat transfer.	**07**
	(b)	Explain Fluidization stating different regimes of Fluidization.	**07**

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