

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER- IV (NEW) EXAMINATION – SUMMER 2015

Subject Code: 2140403

Date: 03/06/2015

Subject Name: Principles of Process Engineering-1

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) Explain in detail three modes of heat transfer with examples of each. 07
(b) Explain the terms with respect to radiation: Absorptivity, Reflectivity, Transmittivity, Emissivity, Black body, Gray body and Monochromatic emissive power. 07
- Q.2 (a) Derive equation of heat transfer rate in case of heat conduction through cylindrical wall using Fourier's law. 07
(b) State and explain in detail Planck's law, Stefan-Boltzmann law, Wien's displacement law and Kirchhoff's law for black body radiation. 07
- OR**
- (b) Explain critical thickness of insulation for pipes. Also, derive equation of critical radius for pipes. 07
- Q.3 (a) Derive equation of heat transfer rate in case of heat conduction through hollow sphere using Fourier's law. 07
(b) Differentiate between Natural and forced convection with examples of each. And give the significance of Reynolds no, Prandlt no, Nusselt no. 07
- OR**
- Q.3 (a) Derive the governing equation for unsteady state heat conduction with neat diagram. 07
(b) Differentiate between Natural Convection and Forced Convection with suitable examples. 07
- Q.4 (a) Explain the construction and working of Shell and Tube heat exchanger with neat sketch. 07
(b) Stating the assumptions and limitations derive corrected form of Bernoulli's equation. 07
- OR**
- Q.4 (a) Derive an equation for log mean temperature difference (LMTD) in heat exchanger. 07
(b) State various methods of dimensional analysis. Explain any one in detail. 07
- Q.5 (a) Explain fluidization, fundamentals and its industrial applications. 07
(b) Classify different types of pumps used in chemical industries. Explain construction and working of centrifugal pumps with neat diagram. 07
- OR**
- Q.5 (a) Define NPSH and state its importance and explain suction head and discharge head. 07
(b) State different metering devices. Explain venturi meter or orifice meter in detail with neat sketch. 07
