

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III (OLD) EXAMINATION – WINTER 2018****Subject Code:130504****Date:01/12/2018****Subject Name:Process Calculation****Time:10:30 AM TO 01:30 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) Define and explain the terms:-Normality, Molality, Molarity. **07**
(b) In a double effect evaporator plant, the second effect is maintained under vacuum of 345 torr. Find the absolute pressure in kgf/cm², kPa, atm, N/m², bar, psi and mm Hg. **07**
- Q.2** (a) Classify the material balance. **07**
(b) An aqueous solution of sodium chloride is prepared by dissolving 25 kg of sodium chloride in 100 kg of water. Determine (a) weight % and (b) mole % composition of solution. **07**
- OR**
- (b) Explain the material balance of extractor. **07**
- Q.3** (a) Define and explain the terms:- Raoult's Law, Dalton's Law **07**
(b) Explain the material balance of crystallizer. **07**
- OR**
- Q.3** (a) Explain: (i) Watson equation and (ii) Riedel equation. **07**
(b) With a neat sketch show the material balance for the following unit operation: (i) distillation (ii) evaporation. **07**
- Q.4** (a) Explain standard heat of reaction and standard heat of combustion. **07**
(b) Discuss the importance of recycling, bypassing and purge operation. **07**
- OR**
- Q.4** (a) Explain importance of process flow sheet in Chemical Engineering Industry with a typical example. **07**
(b) A weight of 1.10 kg of carbon dioxide occupies a volume of 33 liter at 300 K. Using the Van der Waals equations of state, calculate the pressure. Data: For CO₂, take $a = 3.60 \text{ [(m}^3\text{)}^2 \cdot \text{kPa]/(kmol)}^2$ and $b = 4.3 \times 10^{-2} \text{ m}^3\text{/kmol}$. **07**
- Q.5** (a) Write a short note on Orsat analysis. **07**
(b) Why excess air is provided for combustion process? **07**
- OR**
- Q.5** (a) Discuss Proximate and Ultimate analysis of coal. **07**
(b) A gas mixture has the following composition by volume: Ethylene: 35.6%, Benzene: 24.5%, Oxygen: 1.3%, Methane: 15.5%, Ethane 20.0%, Nitrogen: 3.1%. Find: (a) the average molar mass of the gas mixture, (b) the composition by mass and (c) the density of gas mixture in kg/m³ at NTP. **07**
