

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 2130504****Date: 30/11/2019****Subject Name: Process Calculation****Time: 02:30 PM TO 05:30 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 the terms:-Normality, Molality, and Molarity. **03**
(b) Find the value of Universal gas constant R in following units. **04**
1. atm.liter/gm mole.K 2. m³.atm/kmol.K 3. joule/gm mole.K
4. cm³.torr/gm mole.K
(c) Classify the material balance. **07**
- Q.2** (a) What is Fundamental quantity? Give units of following in terms of fundamental quantity: Area, Volume, and Work. **03**
(b) Give classification of fuel in brief. **04**
(c) Iron metal weighing 500 lb occupies a volume of 29.25L. Calculate the density of Fe in kg/dm³. **07**
- OR**
- (c) The diameter and height of a vertical cylindrical tank are 5 ft and 6 ft 6 inch respectively. It is full up to 75% height with carbon tetrachloride (CCl₄), the density of which is 1.6 kg/L. Find the mass in kilograms. **07**
- Q.3** (a) Define terms: - 1. Raoult's Law 2. Dalton's Law 3. Ideal Gas Law. **03**
(b) Why excess air is provided for combustion process? **04**
(c) The analysis magnesite ore obtained from Chalk Hill area, Salem district, yields 81% MgCO₃, 14% SiO₂, and 5% H₂O (By mass) Convert the analysis into mole %. **07**
- OR**
- Q.3** (a) Define CV, GCV and NCV for fuels. **03**
(b) Find the equivalent mass of (1) PO₄ radicals, and (2) Na₃PO₄ **04**
(c) The average molar mass of a flue gas sample is calculated by two different engineers. One engineer uses the correct molar mass of 28 for N₂ and determines the average molar mass to be 30.08, the other engineer, using an incorrect value of 14, calculates the average molar mass to be 18.74. (i) Calculate the volume % of nitrogen in the flue gases, (ii) If the remaining components of the flue gases are CO₂ and O₂, Calculate the volume % each of them. **07**
- Q.4** (a) Define terms: - 1. Dry-Bulb Temperature 2. Wet Bulb Temperature 3. Dew Point **03**
(b) Write a short note on Orsat analysis. **04**
(c) Discuss Proximate and Ultimate analysis of coal. **07**
- OR**
- Q.4** (a) Make the Conversion:- 294 g/L H₂SO₄ and 4.8 mg/mL CaCl₂ to normality. **03**
(b) Explain the material balance of extractor. **04**
(c) Discuss uses of recycling and bypassing operation. **07**
- Q.5** (a) Define STP and NTP condition. **03**
(b) Explain the material balance of crystallizer. **04**
(c) Differentiate between intensive property and extensive property. **07**
- OR**
- Q.5** (a) How many grams of NH₄Cl are there in 5 mol? **03**
(b) Discuss humidification operation. **04**
(c) With a neat sketch show the material balance for the following unit operation: (i) distillation (ii) evaporation. **07**
