

GUJARAT TECHNOLOGICAL UNIVERSITY**DIPLOMA ENGINEERING – 3rd SEMESTER – • EXAMINATION – WINTER 2016****Subject Code: 3330504****Date: 24/11/2016****Subject Name: Industrial Stoichiometry****Time: 10:30 AM To 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Each question carry equal marks (14 marks)
5. Programmable calculator is not allowed.
6. Atomic and Molecular weight: S = 32, O = 16, N =14, H =1, C = 12, Air =28.9

- Q.1** (a) For Ideal gas derive : $C_p - C_v = R$ **07**
 (b) (i) Explain Latent heat of Sublimation. & State first Law of Thermodynamics **04**
 (ii) Convert following
 1. 7 atm to N/m^2 (ii) 3 Kcal to Joule (v) 3.5 m^3 to Litre **03**
- Q.2** (a) Convert 294 grams per liter sulphuric acid into Normality and Molarity **07**
 (b) Define following **07**
 (1) Sensible heat (2) Latent heat (3) Enthalpy(4) Specific Heat (5) Heat Capacity (6) Heat of formation(7) Heat of reaction
 OR
 (b) Justify the importance of Stoichiometry **07**
- Q.3** (a) 200 kg Nitrobenzene is prepared from benzene and nitric acid. Calculate amount of benzene and nitric acid required **07**
 (b) For ideal gas prove that Mole% = Volume% = Pressure% **07**
 OR
- Q.3** (a) A sample of groundnut seeds contain 45% oil, 40% solids and rest Moisture. After extraction, cake composition is 80 % solids, 5% oil and rest Moisture. Find % recovery of oil. **07**
 (b) Define: 1.Limiting Component 2.Yield 3.Conversion **07**
- Q.4** (a) A rectangular tank having dimensions 4 m x 2 m x 5 m is filled with acid of density 1.2 in C.G.S units. Calculate mass of acid in tank **07**
 (b) An aqueous solution contains 19 % NH_3 , 65.6% Ammonium Nitrate $NH_4 NO_3$, 6% Urea ($NH_2CO NH_2$). Calculate available Nitrogen per 100 Kg solution. **07**
 OR
- Q. 4** (a) Groundnut seeds contain 48% oil, 45% solids and rest moisture. The resultant cake contains 82% solids, 3% oil and rest moisture. Find the percentage recovery of oil. **07**
 (b) 500 grams of acetic acid is mixed with 1 litre of water. Find weight ratio and mole ratio of acetic acid **07**
- Q.5** (a) A feed contains 60% Benzene. Top product contains 95% Benzene and bottom product contains 96% toluene. Find quantities of top and bottom **07**

products

- (b) A furnace is fired with fuel oil. The Orsat analysis of fuel gases by volume is given as CO_2 :10.6% O_2 : 6% and N_2 : 83.4% Calculate :1. % excess air 2. C:H ratio in the fuel oil (Assume that fuel does not contain Nitrogen) **07**

OR

- Q.5** (a) Calculate the standard heat of following reaction : $4 \text{NH}_3(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{g})$ Enthalpy of formation ΔH_f° are $\text{NH}_3(\text{g}) = -46.2$, $\text{NO}(\text{g}) = +90.3$, $\text{H}_2\text{O}(\text{g}) = -241.6$ kcal/mol **07**
- (b) Define (i) Recycle (ii) Bypass (iii) Conversion (iv) Yield **07**
