

GUJARAT TECHNOLOGICAL UNIVERSITY**Diploma Engineering - SEMESTER-III • EXAMINATION – SUMMER • 2014****Subject Code: 3330504****Date: 19-06-2014****Subject Name: Industrial Stoichiometry****Time: 10:30 am - 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.
4. Each question carry equal marks (14 marks)

- Q.1** (a) Explain fundamental and derived unit with 3 examples of each **08**
 (b) Define : Molarity, Molality, Normality **06**
- Q.2** (a) Prove that $PV = nRT$. **07**
 (b) The available nitrogen(N) in urea sample is found to be 45% by weight. Calculate the actual urea content in the sample. **07**
- OR
- (b) Calculate the volume occupied by 20 kg of chlorine gas at a pressure of 100 KPa and 298 deg K. **07**
- Q.3** (a) Prove that $C_p - C_v = R$ **07**
 (b) The groundnut seeds containing 45% oil and 45% solids are fed to expeller. The cake from expeller is found to contain 80% solids and 5% oil. Find percentage recovery of oil. **07**
- OR
- Q.3** (a) Define : Limiting reactant, Conversion , Yield, Selectivity. **08**
 (b) A sample of coal contains 63% carbon and 24% ash on weight basis. Analysis of refuse after combustion shows 7% carbon and rest ash. Calculate % of original carbon unburnt in refuse. **06**
- Q.4** (a) Prove that mole % = Volume % = pressure % **07**
 (b) In production of sulphur trioxide, 100 kmol of sulphur dioxide and 200 kmol of oxygen are fed to reactor. Product stream contains 80 kmol sulphur trioxide. Find % conversion of sulphur dioxide. **07**
- OR
- Q. 4** (a) 50 kmol sulphur dioxide and 150 kmol of air is taken to manufacture sulphur trioxide. Calculate % excess air. **07**
 (b) A feed in distillation column contains 28% Benzene and rest toluene by weight. Distillate contains 52 % Benzene and residue contain 5% Benzene. Calculate amount of distillate and bottom product for 1000 kg feed. **07**
- Q.5** (a) Ethanol and water form azeotrope containing 96% ethanol by weight. Find composition by mole %. **07**
 (b) Calculate total available nitrogen in a solution if it contains 30% urea, 20% ammonium sulphate and 20% ammonium nitrate. **07**
- OR
- Q.5** (a) Define : NCV, Heat of Reaction, Heat of formation. **06**
 (b) Write importance of Industrial stoichiometry for chemical engineer. **08**
