

2007-NATIONAL INSTITUTE OF TECHNOLOGY(NIT)

III SEMESTER B.TECH MID TERM EXAMINATION

PROCESS CALCULATIONS
(CHEMICAL ENGINEERING)

TIME-1HOUR
MARKS-40

Note: Answer all questions. Each question carries 8 marks.

1. A solution of sulfuric acid in water contains 22.25% H₂SO₄ (by weight) at 15.6°C. The specific gravity of solution is 1.16. Find the concentration of sulfuric acid in the solution in grams per liter. Also, compute the molarity, normality and molality of the solution. (8)
2. An organic compound contains carbon, hydrogen and oxygen. A sample of the compound weighing 0.660 gm, upon complete combustion gives a 0.968 gm of carbon dioxide and 0.792 gm of water. Calculate the mass percentage of oxygen in the compound. (8)
3. A Stock solution contains 5000 ppm of phenol (C₆H₅OH) in water at 28°C. You are required to prepare 5 liters of phenolic water containing 50 ppm of phenol. What are the quantities of stock solution and distilled water you will take to prepare the required solution? (8)
4. A gas mixture containing 60% CO₂, 10% CO, 5% CH₄ and 25% N₂ by volume at 250°C is flowing through a pipe line under a draft of 2 inches of water, at a flow rate of 1500 liters per minute. Compute the density and mass flow rate of the mixture. (8)
5. A mixture of nitrogen gas and benzene vapor is available at 102.6 Kpa, 26°C, and 90 m³/hr; its relative saturation is 35%. The mixture is isothermally compressed to a final total pressure of 966.3 Kpa. Calculate the rate of condensation of benzene. The vapor pressure of benzene at 26°C may be taken as 100 mm Hg. (8)