Department of Chemical Engineering

Minor II – CHL 727 Heterogeneous catalysis and Catalytic Reactors

Time: 1:00-2:00 **Date: 22 March, 2015**

M.M 20 Venue: **VI 301**

1. For the determination of pore diameter using gas adsorption method use standard thermodynamic relation and derive Kelvin equation correlating vapour pressure and pore radius.How kelvin equation is used for the determination of micropore size distribution. 6

2. A hydrogenation catalyst , NiO/Al_2O_3 cylindrical pellet contains 8 wt% NiO has following dimensions:

   Mass of the pellet = 3.0 g, pellet volume= 3.25 cm^3.

   The alumina pellet has both micropores and macropores. The macropore volume of the pellet is 0.20cm^3 /g, and the micropore volume 0.40cm^3/g of particles. Calculate

   (i) Void fraction of micropore and macropore volumes 2

   (ii) Particle density and the solid fraction. 2

   (iii) Density of the solid phase and void fraction of the particles 3

3. (a) What is the principle of mercury penetration method for estimation of pore size distribution. 3

(b) Explain the terms Fermi level, vacuum level and work function. What are the corresponding properties in terms of molecular orbitals ? 2

4. Discuss the salient objectives of the Design Term Project assigned to you. Also mention the name of the other members of your group. 2