B.Tech. Seventh Semester (Chemical Engineering) (C.B.S.)

# Elective - II : Catalysis Paper - VIII

P. Pages : 1 **TKN/KS/16/7843**

Time : Three Hours * 0 2 7 7 * Max. Marks : 80

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Notes :
1. All questions carry equal marks.
2. Answer **any five** questions.
3. Due credit will be given to neatness and adequate dimensions.
4. Assume suitable data wherever necessary.
5. Diagrams and Chemical equations should be given wherever necessary.
6. Illustrate your answers wherever necessary with the help of neat sketches.
7. Use of slide rule, Logarithmic tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts is permitted.

**1.** a) What are the natural enzymes available in milk? **6**

b) Describe the process of conversion of starch to sugar by enzymes in detail. **10**

**2.** a) Explain triphase catalysis in detail, with appropriate industrial example. **8**

b) Describe Lactose hydrogenation in detail. **8**

**3.** a) How will you predict the multiplicity effect in Trickle bed reactor? Explain. **8**

b) Explain the concept of active sites and adsorption theories. **8**

**4.** a) Discuss the methods of catalyst preparation in detail. **8**

b) A hydrogeneration catalyst is prepared by soaking alumina particles in aqueous solution ($NiNO_3$). After drying and reduction the particles contain about 7 wt % NiO. This catalyst is then made into large cylindrical pellets for rate studies. The gross measurement for one pellet are mass = 3.15 gm, diameter = 2.5 cm. thickness = 0.62 cm, volume = 3.22 $cm^3$. The macropore volume of the pellet = 0.645 $cm^3$ and the micropore volume of pellet is 0.4 $cm^3$/gm of particles. Calculate **8**

i) Density of pellet
ii) The micropore volume in $cm^3$/gm.
iii) The micropore void fraction in pellet.
iv) The macropore void fraction in pellet.
v) Solid fraction.
vi) Density of particles.
vii) Density of solid phase.
viii) Void fraction of particles.

**5.** Explain how structuring zeolite bodies enhances the heat transfer properties of catalyst. **16**

**6.** Discuss the case study of Acetic acid production in the light of Monsanto process to Cativa process. **16**

**7.** a) Discuss the kinetics of trickle bed reactor and elaborate on the fractors affecting it. **10**

b) Discuss the effect of external transport properties on selectivity in catalytic non isothermal reactions. **6**

**8.** a) Discuss enzymatic milk coagulation in detail. **8**

b) What are the industrial applications of fluidized bed reactors. **8**

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