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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December, 2017



Program Name: B.Tech (CE+RP)

Semester : VII

Course Name : Catalyst Design & Catalysis

Max. Marks : 100

Course Code : CHEG 461

Duration : 3 Hrs

No. of page/s: 1

SECTION A 5 X 4 = 20 Marks

1. How does the catalyst change the rate and selectivity of a chemical process?
2. Give the names of different types of catalysis with an example each. Write any one advantage and disadvantage of each one of them.
3. What are the in-situ methods of sulphidation to activate the hydrotreating catalyst?
4. What are the choices of precursor salts of platinum used to impregnate alumina and zeolite? Why?
5. Why is hydrothermal stability of catalyst important in fluidized catalytic cracking (FCC)? How is it imparted to the FCC catalyst?

SECTION B 5 X 8 = 40 Marks

6. Explain how XRD and MAS NMR help to characterize the structure of zeolites.
(Or)
List out the methods available for the analysis of chemical composition of catalyst and explain any one of them in detail.
7. Write a brief account of emerging trends in Catalysts for any one petrochemical process.
8. Explain the physico-chemical transformations brought by the calcination of catalyst and operating variables of calcination..
9. What are the three different shape selectivities shown by the zeolite? Demonstrate how the same is explored in industrial process for each.
10. Explain the four selectivities shown by organometallic catalysts with an example each.

SECTION C 2 X 20 = 40 Marks

11. (a) List out the methods of forming or shaping of catalyst and explain any one technique under each class of method in detail. In the scheme of assembly of solid catalyst where does it appear?
(b) Explain the determination of BET surface area of catalyst.
(Or)
(a) Give a brief account of precipitation and hydrothermal crystallization to prepare the support, purpose and operating variables of their washing.
(b) With the help of diagram, explain the determination of acidity of solid catalysts by temperature programmed desorption.
12. (a) Explain the various parameters by which efficiency of a chemical process is expressed and with suitable examples demonstrate that catalytic processes have an edge over the non-catalytic processes.
(b) Analyze the reactions involved in catalytic reforming, arrive the active centers required to catalyze them and just name the methods to assemble the same into a

solid catalyst.



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