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मोतीलाल नेहरू राष्ट्रीय प्रौद्योगिकी संस्थान इलाहाबाद
प्रयागराज – 211004 [भारत]

Motilal Nehru National Institute of Technology Allahabad
Prayagraj - 211004, [India]

Department of Chemical Engineering

Mid Semester (Even) Examination (Session 2024-25)

Programme Name: B.Tech.
Course Code: CHN16262
Branch: Chemical Engineering
Duration: 90 Minutes

Semester: VI
Course Name: Industrial Catalysis
Student Reg. No.:
Max. Marks: 25

Instructions:
1. Solve the questions as per the given sequence
2. Attempt all the questions

Question 1:
What are the major components of a solid catalyst? Describe the classification of industrial catalysts in detail.

5 Marks

Question 2:
What are the major parameters used to differentiate Physical adsorption and Chemisorption? Write the diffreneces between Physical adsorption and Chemisorption also.

5 Marks

Question 3:
What are the major steps of precipitation process? Explain the different schemes of precipitation process for catalyst preparation with parameters affecting the properties of precipitate.

5 Marks

Question 4:
What are the structural analysis methods used for heterogeneous catalysts? Explain the surface area measurement by Brunauer-Emmett and Teller (BET) method.

5 Marks

Question 5:
Explain Langmuir-Hinshelwood-Hougen-watson model in detail and derive the rate equation for surface reaction as a rate limiting step for decomposition of cumene to benzene and propylene.

5 Marks

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Department of Chemical Engineering

End Semester (Even) Examination (Session 2024-25)

Programme Name: B.Tech.
Course Code: CHN16262
Branch: Chemical Engineering
Duration: 150 Minutes

Semester: VI
Course Name: Industrial Catalysis
Student Reg. No.:
Max. Marks: 50

Instructions:
1. Solve the questions as per the given sequence
2. Attempt all the questions

Ques 1(a): What are the methods of catalyst preparation? Explain the impregnation method for catalyst preparation and give the examples also.

5 Marks

Ques 1(b): What are the characterization methods used for heterogeneous catalysts? Explain X-Ray Diffraction method in detail to calculate crystal size.

5 Marks

Ques 2(a): How many types of reactors are used for heterogeneous system reactions. Explain fixed bed reactor and fluidized bed reactor in detail.

5 Marks

Ques 2(b): What do you understand from activity and selectivity? How these parameters are analysed from experimental data from laboratory reactors?

5 Marks

Ques 3(a): Explain Eley Ridel model in detail and derive the rate equation for surface adsorption as a rate limiting step.

5 Marks

Ques 3(b): Explain the effect of external mass transfer resistance on activation energy of reaction.

5 Marks

Ques 4(a): What are the ways of catalyst deactivation? Explain their deactivation kinectics also.

5 Marks

Ques 4(b): Determine the deactivation kinetic parameters for a first order reaction in a mixed reactor under constant flow condition.

5 Marks

Ques 5(a): What are monolithic catalysts and how these are important for the chemical industry?

5 Marks

Ques 5(b): How fuel cell catalysts are designed and how it's catalytic activity can be increased?

5 Marks