This question paper contains 3 printed pages.]

4326 *Your Roll No. .....*

M.Tech. / Sem. III **A**

CHEMICAL SYNTHESIS AND PROCESS TECHNOLOGIES

Paper Module – 22 : Industrially Important Solids

(Admission of 2008 and onwards)

Time : 2 Hours *Maximum Marks : 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

*Answer all questions of any **three** parts.*

Part I

A (06) Discuss the origin of the pH dependent and independent acidic sites in clay minerals?

B (06) List out the h, k, l values for the first ten reflections of a solid crystallizing in a body centered cubic structure.

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Part II

A (06) Describe a method by which the surface acidity and cation exchange capacity of a naturally occurring clay sample can be estimated.

B (07) With the help of a suitable example, discuss how the radius ratio of the ions involved can be useful in predicting the structure of a solid. How do you estimate the average crystallite size of a solid sample from its powder X-ray diffraction patterns?

Part III

A (06) With the help of an appropriate diagram discuss the structural differences between the Amphibole and Pyroxene minerals.

B (07) Discuss the reason behind the shape and size selectivity of zeolite catalysis. Is ZSM 5 a better Catalyst for fluid cracking? Justify your answer.

Part IV

A (06) Predict the structure and geometry of any 03 of the following.

$[Fe_4C(CO)_{12}]^{-2}$, $[H_3Ru_4(CO)_{12}]^{-1}$,

$[Os_{10}C(CO)_{24}^{-2}$, $[Os_8(CO)_{22}]^{-2}$, $[Mn_3(CO)_{14}]^{-1}$

B (06) The lattice parameters of a primitive cubic zeolite is 4.200 Å, calculate the 2θ positions and *d* values of the 301, 400 and the 111 reflections determined by copper radiation (λ = 1.5405Å).