

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI, PILANI CAMPUS
II Semester 2016-2017
CHE F 419: Chemical Process Technology
Comprehensive examination 15/05/2017: OPEN BOOK

Duration: 9:45 - 11:00 AM

Max. Marks: 45

Note: Paper consist of total of 4 questions.

To the point answers would fetch more marks & would save time.

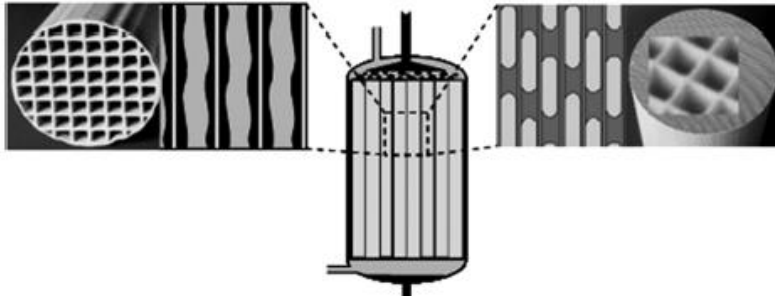
1. Answer the following:

[2+2+3+5=12]

- a) A residual oil feed is injected into the reactor and contacted with a hot fluidized bed of coke. Thermal cracking takes place producing gas, liquids, and more coke. **Which process is mentioned here?**
- b) UOP Uniflex™ Process: It is high conversion commercially proven technology, that processes low quality residue streams, like vacuum residue, to make very high quality distillate products: **Which process is mentioned here?**
- c) Initially axial flow reactors were used for catalytic reforming but at present, radial flow reactors are preferred, why (Limit answer to one specific reason only)?
- d) How are LHSV & WHSV defined? Why does it play a deciding factor in development of one kind of refinery based processes?

2. Given below is a schematic showing the Film flow vs Taylor flow. Answer the following questions. (Be precise in answering).

[3+2+5=10]



- a) Why are the microscale and the nanoscale relevant for process intensification (PI)?
 - b) Explain “**give each molecule the same processing experience**” which is one of the PI approaches.
 - c) Compare Taylor flow with single-phase liquid flow in a capillary. If in a liquid phase process plug-flow behavior is desired, could a monolith reactor still be used?
- 3. The strategy for developing new technologies or products is an important concern in research and development (R&D) departments for the chemical industry. For bulk chemicals, which can be produced from only a limited number of feedstocks by a limited number of reactions, the majority of the R&D activities concerns process design and scale-up. Answer the following questions.**

[3+3+3+2=11]

- a) How does **one approach for the flow sheet development** of any bulk chemical strating from laboratory stage?

- b) Which **unit operation/s** would be included while commercializing the production of chosen bulk chemical?
- c) Which **limitations need to be explored** in case thermodynamically the reaction conditions are favourable but kinetically not?
- d) At the early stages, of a plant development, a comparison of the raw material costs with the product value can already give an indication? What do you conclude from the same?

4. In the cement manufacturing, answer the following` [3+4+5= 12]

- a) The aluminates & silicates of calcium fuse together to form small and hard stones known as clinkers of size varying from 5-10 mm. **Show three reactions for clinker formations.**
- b) Explain the working of cyclone preheaters.

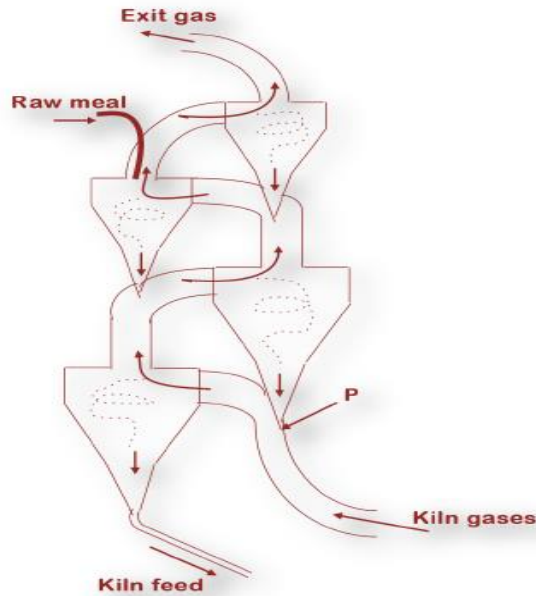


Figure: Cyclone preheaters

- c) compare the criteria given for dry process & wet process with only with one specific answer.

SNO.	Criteria	Dry Process	Wet Process
1.	Physical sate of raw material		
2.	Fuel consumption		
3.	Time of Processing		
4.	Quality of cement		
5.	Overall cost of production		