PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Summer 2021-22 Examination

Semester: 8   Date: 01/04/2022
Subject Code: 203103453 / 03103454   Time: 10.30 am to 1.00 pm
Subject Name: Process Synthesis   Total Marks: 60

Instructions:
1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - ((All are compulsory) (Each of one mark) **(15)**

1. _____in process design requires the manufacture of specified products in spite of variations in the feed, the process handles.
   a) Environmental concerns   b) Economic evaluation   c) Flexibility   d) None of these

2. _____attempts to determine whether any reasonable combination of events leads to unsafe conditions.
   a) Safety analysis   b) Environmental concerns   c) Economic evaluation   d) None of these

3. _____involve satisfying the very large number of regulations the government imposes on the operation of a process.
   a) Safety   b) Environmental concerns   c) Hazards   d) None of these

4. A _____ will want to start working on the problem immediately while the _____ person will want the team members to get to know each other first.
   a) amiable, driver   b) analytical, driver   c) driver, analytical   d) driver, amiable

5. Chemical Engineers create processes to manufacture various _____

6. The first step in process synthesis is _____.
   a) Environmental concerns   b) Economic evaluation   c) Flexibility   d) to gather relevant information

7. The full form of HTRI is _____.

8. What is the advantage of analysis of process synthesis.

9. Batch processes are commonly used to manufacture specialty chemicals with relatively Short life cycles   (True or False)

10. Jobshop plants are also denoted as _____ plants.
    a) Chemicals   b) reactants   c) multipurpose   d) multiproduct

11. The policy in which it is assumed that the batch can be stored without any capacity limit in the storage vessel is _____.
    a) NIS   b) UIS   c) ISIS   d) ZW

12. The scheduling term _____ corresponds to the total time required to produce a given number of batches.
    a) Cycle time   b) production time   c) time   d) makespan

13. The _____the production cycle, the _____the inventory we need to carry since products are available more frequently.
    a) shorter, less   b) longer, less   c) shorter, more   d) longer, more

14. When process plants cease to run someday, the company must design and execute a process to _____the plant.
    a) decommission   b) commission   c) recommission   d) mission

15. Preliminary process design requires us to evaluate alternative flowsheets_____.
    a) quickly   b) correctly   c) incorrectly   d) hastily

Q.2 Answer the following questions. (Attempt any three)   **(15)**

    A) What are parallel strategies for process synthesis?

    B) What are ZW, NIS, and UIS policies? Explain with examples?

    C) Explain "layout and 3D modeling" and "Board of Director's Design problem"?

    D) What is a recipe? What are CT and Makespan?

Q.3 A) Assume a 2-stage plant to produce 5,00,000 lb/year of product C. The plant is assumed to   **(07)**
operate 6000 hr./year. The recipe for producing product C is as follows:

    1. Mix 1 lb A, 1 lb B and react for 4 hours to form C. The yield is 40% in weight and the density
    of the mixture is 60 lb/ft^3.

    2. Add 1 lb solvent and separate by centrifuge during 1 hour to recover 95% of product C. The
    density of the mixture is 65 lb/ft^3.

Calculate the volume of vessels with ZW policies and by placing two units operating in parallel out
of phase.

B) What are the decisions for synthesis of Multi-product Batch Plants and explain them?   **(08)**

<div align="center">OR</div>

B) What are the basic steps in Flowsheet synthesis?   **(08)**

Q.4 A) Write brief description about Heat Exchanger Networks (HEN) and Pinch Technology?   **(07)**

<div align="center">OR</div>

    A) What are bounding strategies for process synthesis?

    (07)

    B) Explain hierarchical decomposition for process synthesis?   **(08)**