FACULTY OF ENGINEERING

Midterm exam
2024-2025

KOU UNIVERSITY

Department: Chemical Engineering
Stage/ Year: 3
Total Mark: 100

Course Title: Plant Design
Course Code: KOU20453
Time Allowed: 90 minutes
Attached Sheet:

Q1: 40 marks

1. Explain the difference between gas cyclones and hydrocyclones.
2. Describe two advantages and two disadvantages of using cyclone separators in chemical processes.
3. Explain the differences between using a large vs. small cyclone separator, considering **efficiency, pressure drop, and volumetric flowrate**
4. What are the major differences between batch and continuous processing? Provide examples.

Q2: Answer all:

1.A cyclone separator operates at an inlet velocity of 15 m/s. If the particle size is 0.005 kg and the radial distance from the cyclone wall is 0.1 m, calculate the centripetal force acting on the particle. (20 marks)

2. Show Design constraints in a diagram ; describing both enternal and external constraints. (20 marks)

Q3: Define the following terms: **answer all** (20 marks)

1. Standards
2. Codes
3. Cut Point
4. Reverse flow cyclone

KOYA UNIVERSITY

Final Examination
Spring Semester (2024-2025)

Faculty of Engineering
Department: DCHE
Stage: 3rd stage
Total Mark: 40

Module Name: Plant Design
Module Code: KOU20453
Time Allowed: 120 minutes
Attached Sheet: No

Answer All Questions

1. Show the anatomy of a chemical manufacturing process in a block diagram. (10 marks)
2. Answer (4) of the following questions:
   A. What are the main roles of chemical engineers as a process designer? list them briefly? (5marks)
   B. Explain why we should separate needs from wants during designing a chemical process plant. (5marks)
   C. List two points of what modern engineering standards cover. (5 marks)
   D. Compare reverse flow and axial flow separators (5 marks)
   E. Explain the importance of material selection in separators and give examples of protective materials used (5 marks)

3. (10 marks). A particle with a mass of 0.005 kg is moving inside a cyclone separator. The air velocity is 20 m/s, and the radial distance from the cyclone wall is 0.1 m.
   A. Calculate the centripetal force acting on the particle.
   B. If the radial distance is halved, what will be the new centripetal force? Briefly explain your reasoning.