

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Fifth Semester

Instrumentation and Control Engineering**20ICEL503 - UNIT OPERATIONS AND CONTROL**

Regulations - 2020

(Heat and Mass Transfer Data Book is permitted)

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

			Marks	K Level	CO
1. Identify the equipment is used to reduce particle size to fine powder? (a) Jaw crusher (b) Ball mill (c) Vibrating screen (d) Bin			1	K1	CO1
2. The equation for calculating the angle of repose is _____ (a) $\tan(h/d)$ (b) $\tan^{-1}(2h/d)$ (c) $\tan(h/2d)$ (d) $\tan^{-1}(h/2d)$			1	K1	CO1
3. Choose the option that works on the principle of centrifugal separation? (a) Sedimentation tank (b) Cyclone separator (c) Thickener (d) Hopper			1	K1	CO2
4. The mixing of immiscible liquids requires (a) Paddle agitator (b) Propeller mixer (c) Turbine agitator (d) None of these			1	K1	CO2
5. Synthesis Reaction is (a) $AB = A + B$ (b) $A + BC = AC + B$ (c) $A + B = AB$ (d) $AB + CD = AC + BD$			1	K1	CO3
6. Batch distillation is primarily controlled by (a) Pressure (b) Flow rate (c) Reflux ratio (d) Temperature			1	K1	CO3
7. Recognize the first step in the crystallization process (a) Drying (b) Nucleation (c) Cooling (d) Precipitation			1	K1	CO4
8. _____ is a process used to dry extremely heat- sensitive materials. (a) Drum drying (b) spray drying (c) Freeze drying (d) Tray drying			1	K1	CO4
9. Select the fluxes which is not used in steel making (a) Limestone (b) Dolomite (c) Quartzite (d) Fluorspar			1	K1	CO5
10. Pulp industry mainly uses which separation technique? (a) Cyclones (b) Magnetic separators (c) Gravity settling (d) Flocculation			1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. State the principle of granulation and list its industrial applications.	2	K1	CO1
12. Name the four common ways of breaking solids in size reduction machines.	2	K1	CO1
13. List the types of settling.	2	K1	CO1
14. Contrast between agitation and mixing.	2	K2	CO2
15. Discuss the applications of electrostatic separators in industrial separation processes.	2	K2	CO2
16. Explain the concept of thickening and distinguish it from sedimentation.	2	K2	CO2
17. Recall a reboiler and its function in a distillation column.	2	K1	CO3
18. What is More Volatile component?	2	K1	CO3
19. Explain conduction process.	2	K2	CO4
20. Explain Forced Draught Cooling Tower.	2	K2	CO4
21. Describe the role of electrostatic separation in the leather industry.	2	K2	CO5
22. Identify how magnetic separation enhances raw material quality in the steel industry.	2	K2	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23. a) (i) Infer a conveyor and explain different types of conveyors used in industries with a neat sketch. 11 K2 CO1
- OR**
- b) (i) Describe the working principle of an electrostatic separator with a labeled sketch. 6 K2 CO1
(ii) Explain the principle of granulation and its importance in size enlargement. 5 K2 CO1
24. a) Illustrate the principle construction and working of Laboratory Batch Sedimentation Test and show Settling Velocity Curve. 11 K2 CO2
- OR**
- b) Explain the principle construction and working of Cyclone separator. 11 K2 CO2
25. a) Explain how combustion control is implemented by means of cross-limited combustion control scheme in boiler operations of thermal power plant. 11 K2 CO3
- OR**
- b) Interpret McCabe -Thiele method in distillation process. 11 K2 CO3
26. a) Analyze the roles of nucleation and crystal growth in crystallization processes. How do operating parameters such as temperature, concentration, and agitation affect each stage? 11 K2 CO4
- OR**
- b) Analyze the operation of a cooling tower by breaking down its heat and mass transfer mechanisms. How do environmental conditions impact its performance? 11 K2 CO4
27. a) Explain the unit operations involved in Thermal power plant. 11 K2 CO5
- OR**
- b) Summarize steel production process with a neat sketch. 11 K2 CO5
28. a) (i) Compare and contrast single-effect and multiple-effect evaporators in terms of steam economy, operational complexity, and cost. 6 K2 CO4
(ii) Paraphrase Sulifite process with neat sketch. 5 K2 CO5
- OR**
- b) (i) Evaluate the suitability of different refrigeration cycles used in chemical industries for various applications. 6 K2 CO4
(ii) Which are the important processes involved in Leather manufacturing? Explain. 5 K2 CO5