

**VIT[®]**Vellore Institute of Technology
(Established as the Vellore Institute of Technology in 1984)**Final Assessment Test – July 2023**

Course: BCHE304L - Chemical Process Technology and Economics

Class NBR(s): 0104 / 0112

Time: Three Hours

Slot: C1+TC1+TCC1

Max. Marks: 100

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**General Instructions:**

- (a) Draw Flowsheet wherever necessary. Use Scale, Pencil and Pro-circle to draw flowsheet
(b) For Comparison/differentiation based Questions, min.10 points in tabular column type is expected

Answer any TEN Questions**(10 X 10 = 100 Marks)**

1. a) Explain different types of cement. [4]
b) Draw a neat flowsheet for the manufacture of soda ash by solvay process. [6]
2. Explain the manufacture of oxygen and nitrogen.

3. A company plans to study the feasibility by integrating (combining) production of wood pulp by sulfate process and production of white liquor from black liquor (black liquor is used as feed from sulfate process). During the integration (combining), the following recommendations were suggested by the company.

- (i) Use of Blender instead of Mix Tank
- (ii) Use of Single Effect Evaporator System instead of multiple effect evaporator system
- (iii) Separation of boiler unit and combustion chamber and use as individual units rather than fused chamber.
- (iv) Use of Electrostatic precipitator instead of Cottrell Precipitator
- (v) Use of Centrifugation unit instead of Clarifier unit which recovers the sludge from green liquor
- (vi) Continuous digester unit to be segregated into 3 separate (individual) units based on difference in Temperature.
- (vii) Avoid using Lime Slaker unit. Treat the lime directly into the causticizing tank

Draw a neat flowsheet and report as a single flowsheet incorporating all the suggestions recommended by the company during integrating (combining) production of wood pulp by sulfate process and production of white liquor from black liquor (black liquor is used as feed from sulfate process).

4. Explain the extractive method for the recovery of vegetable oil from seeds using a neat flowchart.

5. Describe the catalytic reforming process of crude oil with neat flowsheet.
6. Compare Primary Refining and Secondary Refining Process.
7. What are the changes encountered in the system when the following changes were suggested by a company during the manufacture of phosphoric acid and chemical fertilizer from phosphate rock by strong acid process.

- a) Use of one neutralizing unit instead of three numbers of neutralizing unit
- b) Replacing single effect evaporator with multiple effect evaporator
- c) Use of Rotary filter instead of travelling pan filter
- d) Use of Tray dryer instead of Rotary dryer
- e) Use of Sinterer instead of grinder

8. Name the types of Depreciation in accounting procedure.

Explain the depreciation process MACRS in detail with an example.

9. A shell-and-tube heat exchanger of 1000 ft^2 surface area fabricated of carbon steel was purchased in 1995 for \$30,000.

- a) Estimate the purchased price for a 2500 ft^2 exchanger using six-tenths exponent.
- b) You read in the literature that exchangers of this size had a 0.70 cost capacity exponent.

What is the difference in price compared to that using an exponent of 0.6?

The 1995 CE Index is 381 and the 2021 one is 736.

10. Explain the role of a Field Engineer in Chemical Plant/Industry.
11. Analyse the Cashflow of a processing industry with a cash flow chart.
12. Write short notes on:

- a) Direct and indirect costs
- b) Cost and asset accounting

[5]

[5]

