



A Charutar Vidya Mandal's Institution  
**V.P. & R.P.T.P. SCIENCE COLLEGE**  
(AUTONOMOUS) (Grant – in – Aid)  
Affiliated to Sardar Patel University



Roll No. & Sign:

**Bachelor of Science (Semester – 5) Internal Theory Examination – 2025**

**US05MAICV02: Plant Design and Mechanical Operations**

**Date: 23<sup>rd</sup> September, 2025**

**Time: 10:45 AM to 12:15 PM**

**Day: Tuesday**

**Total Marks: 30 Marks**

**Q – 1 Answer the following Multiple-Choice Questions. (All are compulsory) [06]**

1. The evaluation of a chemical plant project primarily involves:  
(A) Material balance and energy balance (B) Cost estimation and profitability analysis  
(C) Plant layout and equipment design (D) Selection of raw materials and utilities
2. Cyclones separate particles based on:  
(A) Centrifugal force (B) Filtration  
(C) Evaporation (D) Heat
3. Industrial screening is used for:  
(A) Separating particles based on size (B) Changing chemical properties  
(C) Compressing gases (D) Boiling Liquids
4. Filter aids are used to:  
(A) Improve filtration rate and clarity (B) Increase particle size  
(C) Measure pressure (D) Heat the liquid
5. Which method is generally used for mixing solids with solids?  
(A) Turbine agitator (B) Planetary mixer  
(C) Ribbon blender (D) Propeller agitator
6. Liquid-liquid mixing involves:  
(A) Two immiscible or miscible liquids (B) Solid and liquid  
(C) Two solids only (D) Gas and liquid only

**Q – 2 Write short notes on the construction, working, and use of Jaw Crusher. [06]**

**OR**

**Q – 2 Differentiate between Crushing and Grinding. [06]**

**Q – 3 Explain the construction, working, and efficiency of Plate and Frame Filters with a labelled diagram. [06]**

**OR**

**Q – 3 Explain Electrostatic separation and Magnetic separation with examples and neat sketch. [06]**

**Q – 4 What are the main principles of project development and evaluation in chemical industries? [06]**

**OR**

**Q – 4 Explain the steps involved in process design and how optimal processes are selected. [06]**

**Q – 5 What are the types of mixing operations? Discuss common challenges faced during industrial mixing. [06]**

**OR**

**Q – 5 Discuss the role of surfactants in industrial processes. How do they affect surface and interfacial tension? [06]**



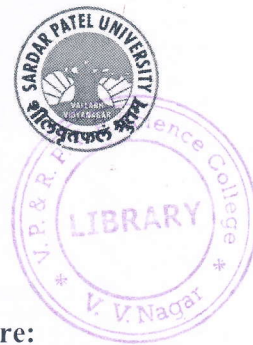
Roll No. & Sign:

**QUIZ TEST**

Supervisor Signature:



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**US05MAICV02:**

*Plant Design*

**& Mechanical Operations**

**Date: 23<sup>rd</sup> September, 2025**

**Time: 10:45 AM to 12:15 PM**

**Obtain Marks:**

**Day: Tuesday**

**Total Marks: 15 Marks**

**Examiner Signature:**

Note: The figure to the right indicates full marks of the questions.

**Q-1 Fill in the blanks with the appropriate answer given in the bracket [8 Marks]**

1. Economic evaluation of a project mainly involves Cost estimation and \_\_\_\_\_ analysis.  
(Profitability / Risk)
2. A major key factor influencing plant design is the availability of \_\_\_\_\_.  
(Raw Materials / Product)
3. Primary crushers are used for \_\_\_\_\_ reduction of large rocks or ores. (Coarse / Powder)
4. Fine grinders are used to produce very \_\_\_\_\_ particles. (Heavy / Small)
5. Sand filters are commonly used for removing \_\_\_\_\_ particles from water. (Suspended / Viscous)
6. Thickeners are used in \_\_\_\_\_ sedimentation processes. (Continuous / Batch Only)
7. Mixing is the process of combining two or more materials to form a \_\_\_\_\_ mixture.  
(Homogeneous / Viscous)
8. Solid-solid mixing is commonly used in \_\_\_\_\_ blending. (Powder / Gas)

**Q-2 State whether the following statement is true or false. [Write your answer in the box] [7 Marks]**

1. Engineering flow diagrams are mainly used to calculate the cost of the project.
2. Plant layout must consider safety, accessibility, and provision for future expansion.
3. Process design aims to reduce efficiency and increase cost.
4. Vibrating screens are used in industrial screening for size separation.
5. Sedimentation depends only on fluid colour.
6. Froth flotation is used to separate fine particles based on surface properties.
7. Mixing is done to produce a homogeneous mixture.