

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 6 – EXAMINATION – SUMMER 2026

Subject Code: 3164405

Date: 03/06/2026

Subject Name: Energy Efficiencies in Mechanical Operations

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

- Q.1**
- (a)** Define volume surface mean diameter, screen efficiency, and ideal screen. **03**
 - (b)** Differentiate between i) differential and cumulative analysis and ii) ideal and actual screen **04**
 - (c)** Develop the equation for the calculation of effectiveness of the screen. **07**

- Q.2**
- (a)** Define Power no, Reynolds no and Froude no. **03**
 - (b)** Describe various laws for size reduction and write principle of comminution. **04**
 - (c)** A material is crushed in a jaw crusher and the average size of the particle is reduced from 5 cm to 1.3 cm with consumption of energy at the rate of 37 Watt.hr/ton. What will be the consumption of energy necessary to crush the same material of average size 8 cm to an average size 3 cm? The mechanical efficiency remains same. (a) Using Rittinger's law; (b) using Kick's law **07**

OR

- Q.2**
- (c)** Describe open circuit and closed circuit operation with neat sketch. **07**
- Q.3**
- (a)** Enlist the industrial applications of batch and continuous fluidization. **03**
 - (b)** Differentiate between particulate fluidization and bubbling fluidization **04**
 - (c)** Discuss minimum fluidization velocity and pressure drop in fluidized bed with neat sketch. **07**

OR

- Q.3**
- (a)** Classify the filtration equipments with examples in each category. **03**
 - (b)** Differentiate between the Crusher and grinder. **04**
 - (c)** With neat diagram explain construction and working of plate and frame filter press. state its advantages and limitations also. **07**

- Q.4**
- (a)** Define mixing index and its significance. **03**
 - (b)** Discuss selection criteria of agitator. **04**
 - (c)** With the help of neat sketch explain different types of impellers for agitation of liquids along with application. **07**

OR

- Q.4**
- (a)** Define filter aid and write use of it in filtration. **03**
 - (b)** Differentiate between agitation and mixing. **04**

(c) Explain the construction and working of cyclone separator in detail. **07**

- Q.5**
- (a)** Classify various size reduction equipments. **03**
 - (b)** Discuss the different criteria's for selection of conveyors. **04**
 - (c)** Describe the pneumatic conveying system with sketch. **07**

OR

- Q.5**
- (a)** Write short note on storage in bin and silos. **03**
 - (b)** Define sphericity. Find the sphericity cylinder having $D=H$. **04**
 - (c)** With the help of a neat sketch explain the construction and working of a toothed roller crusher and write the important equations for roll crusher. **07**
