

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - III EXAMINATION - WINTER 2025

Subject Code: BE03021031

Date: 19-12-2025

Subject Name: Basics of Metallurgy Engineering

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.**

	Marks
Q.1 (a) State your views on evolution of modern metallurgy from ancient metallurgy.	03
(b) Looking to the trends and scenario of today's era, what is the scope of materials and metallurgy?	04
(c) List the various fields of metallurgy and map the manufacturing industries to that field with name which are well-known. Explain the need of metallurgy engineer in the industries.	07
Q.2 (a) Define the terms: Ductility, Malleability, Toughness with examples.	03
(b) Define unit cell, How crystal system is formed? List the crystal system.	04
(c) List the criteria for the selection of material for engineering application. Milan is designing a DC-powered semiconductor component for use inside a nuclear reactor. Based on the application, which material selection criteria should guide his choice of engineering material?	07
OR	
(c) Which cubic crystal structure is ductile in nature? Calculate the APF of the identified structure.	07
Q.3 (a) Draw the Miller Indices planes and directions for the followings: $(1\ 0\ 1)$, $(\bar{1}\ \bar{1}\ 0)$, $[1\ 1\ 1]$	03
(b) Define slip system. Why FCC metals are more ductile than BCC metals? Justify.	04
(c) What is imperfections in the crystal? Explain point defects, line defects.	07
OR	
(a) Differentiate between macro and micro examination.	03
(b) What are the information one can extract from quantitative metallography?	04
(c) Draw a schematic ray diagram of metallurgical microscope. Explain its working principle.	07

- Q.4 (a)** Define the terms for metallurgical microscope: resolution, magnification and numerical aperture. **03**
- (b)** Classify the ferrous alloys. **04**
- (c)** Classify the carbon steel based on carbon percentage and write their properties and applications. **07**

OR

- (a)** What is the difference between ferrous and non-ferrous terms? **03**
- (b)** Classify the types of cast irons according to forms of carbon. **04**
- (c)** Define founding and foundry. Classify the types of foundry. What is the procedure to cast the product? Explain by flow chart. **07**
- Q.5 (a)** A mild steel specimen of original diameter 10 mm and gauge length 50 mm is subjected to a tensile load of 20 kN. **03**
- (a) Calculate the stress developed in the specimen.
- (b) If the extension measured is 0.25 mm, calculate the strain.
- (c) If the specimen fails at a load of 25 kN, compute the ultimate tensile strength (UTS).
- (b)** What is the minimum separable distance between features that can be resolved by a microscope using the light of 500 nm wavelength, having refractive index of lens is 1.9 and aperture angle 150° . **04**
- (c)** Give an introduction of metal forming processes. Introduce rolling process and its types. Which mechanical property is prime factor to roll the product? **07**

OR

- (a)** While drawing stainless steel, the wire shows excessive work hardening. What process adjustments can be made to maintain ductility without breaking during further drawing? **03**
- (b)** With neat sketch, What are the types of extrusions? **04**
- (c)** What do you mean by welding? Briefly explain and classify the processes to join a metals and alloys. **07**
