UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DTD 2112
COURSE	: METALLURGY
SEMESTER/SESSION	: 2 - 2024/2025
DURATION	: 2 HOURS

Instructions:

1. This booklet contains 4 questions. Answer all questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 4 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Metals is divided into ferrous and non-ferrous. Define and list two (2) examples of each:

i. Ferrous metals (4 marks)

ii. Non-ferrous (4 marks)

b) Describe five (5) properties metals. (5 marks)

c) Illustrate:

i. Aluminum alloys (2 marks)

ii. Copper alloys (2 marks)

iii. Nickel alloys (2 marks)

iv. Titanium alloys (2 marks)

v. Magnesium alloys (2 marks)

vi. Zinc alloys (2 marks)

QUESTION 2

a) Describe the carbon content range for:

i. low alloys (2 marks)

ii. high alloys (2 marks)

iii. low carbon steels (2 marks)

iv. medium carbon steels (2 marks)

v. high carbon steels (2 marks)

b) Demonstrate types, two (2) characteristics and two (2) applications of steels below:

i. Low carbon steels (5 marks)

ii. Medium carbon steels (5 marks)

iii. High carbon steels (5 marks)

QUESTION 3

a) Define the terminology in phase diagram below:

i. Components (2 marks)

ii. Solvents and solutes (2 marks)

b) Using the Gibbs phase rule to express the degree of freedom for point labelled A-C in the Pb-Sn phase diagram in Figure 1 below.

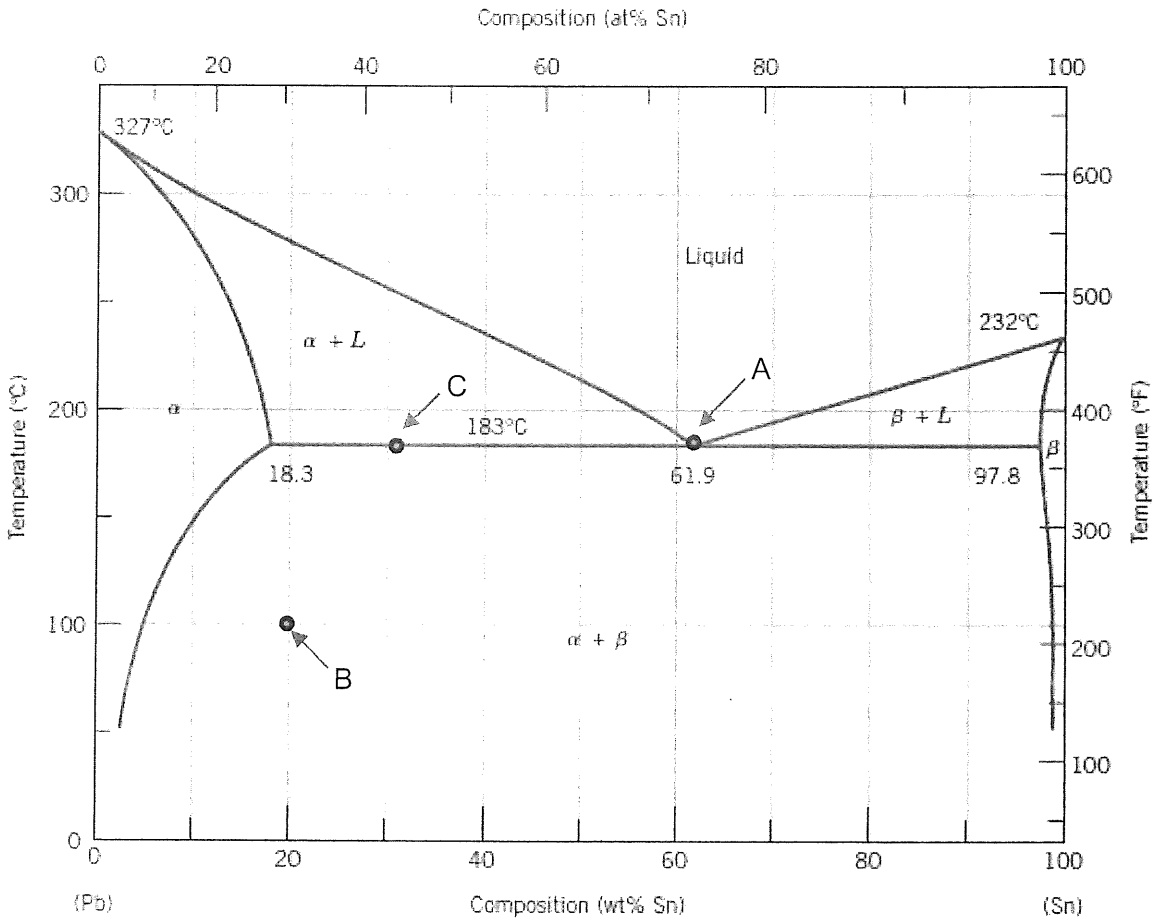

Figure 1: Pb-Sn phase diagram

i. Point A (3 marks)

ii. Point B (3 marks)

iii. Point C (3 marks)

c) A lead-tin of alloy in Figure 1 of composition 60wt% Pb–40wt% Sn slowly heated to temperature of 150°C. Solve

i. Composition of α (2 marks)

ii. Composition of β (2 Marks)

iii. Weight fraction of α (4 Marks)

iv. Weight fraction of β (4 Marks)

QUESTION 4

a) Define what is surface hardening and give three (3) purposes of surface hardening. (5 marks)

b) Describe the active ingredient for surface hardening below:

i. Cyniding (2 marks)

ii. Nitriding (2 marks)

iii. Flame hardening (2 marks)

iv. Induction hardening (2 marks)

iii. Illustrate the three (3) methods of carburising

i. Liquid carburising (4 marks)

ii. Pack carburising (4 marks)

iii. Gas carburising (4 marks)

----------End of question----------