UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BME 2012
COURSE	: MATERIALS ENGINEERING
SEMESTER/SESSION	: 1 - 2022/2023
DURATION	: 2 HOURS

Instructions:

1. This booklet contains 5 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 6 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Give four (4) characteristics of metals. (4 marks)

b) Describe the material structure below:

i. Body-centred cubic (BCC) (2 marks)

ii. Face-centred cubic (FCC) (2 marks)

iii. Hexagonal close-packed (HCP) (2 marks)

QUESTION 2

a) Phase diagram shows the relationship of temperature, composition, phase and microstructure in equilibrium conditions. Name four (4) equilibrium microstructure exists in the Fe-C phase diagram. (4 marks)

b) Illustrate the carbon content and microstructure for

i. low carbon steel (2 marks)

ii. medium carbon steel (2 marks)

iii. high carbon steel. (2 marks)

c) Differentiate the microstructure/appearance and mechanical properties of

i. White iron (2 marks)

ii. Gray iron (2 marks)

iii. Ductile iron (2 marks)

iv. Malleable iron (2 marks)

v. Graphite iron (2 marks)

QUESTION 3

a) List four (4) characteristics of aluminum non-ferrous metal. (4 marks)

b) Illustrate the main differences between copper alloys brass and bronze. (8 marks)

c) Nickel and its alloys also known as superalloys. Distinguish four (4) general properties of nickel and its alloys. (8 marks)

QUESTION 4

a) Polymers are carbon-based materials consist of a long chain. Give

i. Three (3) type of polymers (3 marks)

ii. Three (3) general properties of polymer (3 marks)

iii. Three (3) molecular chain structure (3 marks)

b) Discuss amorphous and crystalline structure polymer. (4 marks)

c) Elastomers is the most flexible and high elasticity types of polymers. Illustrate any two (2) types of elastomers and three (3) of their general applications. (5 marks)

d) Compare thermoplastics and thermosetting polymers in terms of (12 marks)

i. Mechanical properties upon heating

ii. Possible molecular structures

iii. Name four (4) types of each polymer group

QUESTION 5

a) Describe the components/phases of composite materials (6 marks)

b) Illustrate how the orientation of the fibre in composite affect the properties of the composite (6 marks)

c) Biomaterial is a material design to be used for medical purposes. Outline four (4) applications of biomaterial in medical. (8 marks)

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