

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: BME 2012 5/1
COURSE	: MATERIALS ENGINEERING
SEMESTER/SESSION	: 1 - 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) List four (4) characteristics of polymers. (4 marks)
- b) Describe the material bonding below:
- i. Ionic bonding (2 marks)
 - ii. Covalent bonding (2 marks)
 - iii. Metallic bonding (2 marks)
- c) Illustrate how raw materials' (ore) availability will affect their cost. (4 marks)

QUESTION 2

- a) Describe characteristics of these copper alloys:
- i. Brass (2 marks)
 - ii. Bronze (2 marks)
 - iii. Aluminum bronze (2 marks)
- b) Aluminum alloys can be categorise into 4 groups. Name each group and illustrate their differences. (12 marks)
- c) Titanium and its alloys are one of superalloys. Distinguish each type of titanium alloys listed below:
- i. Alpha Ti-alloys (2 marks)
 - ii. Beta Ti-alloys (2 marks)
 - iii. Alpha-beta Ti-alloys (2 marks)
 - iv. Near alpha Ti-alloys (2 marks)

QUESTION 3

- a) Describe the composition and characteristics of each type of glass listed below:
- i. Soda-lime glass (5 marks)
 - ii. Boro-silicate glass (5 marks)
- b) Clay product is categorized into structural clay and whiteware. Demonstrate their difference and give example of their product:
- i. Structural clay (5 marks)
 - ii. Whiteware (5 marks)
- c) Advanced ceramics are also known as engineering ceramics which the application of these type of ceramics are very crucial. Outline the characteristics, properties and applications of advanced ceramics in
- i. Ball bearings (6 Marks)
 - ii. Optical fibres (6 Marks)

QUESTION 4

- a) Define what is composite materials and state its categories. (4 marks)
- b) Illustrate the effect on mechanical properties when the composite is having a condition of
- i. Short fibre at 0° orientation (2 marks)
 - ii. Short fibre at 45° orientation (2 marks)
 - iii. Short fibre at 90° orientation (2 marks)
 - iv. Short fibre at random orientation (2 marks)

c) Biomaterial is a material design to be used for medical purposes. Outline the applications of biomaterials in

- i. Medical implants (4 marks)
- ii. Regenerate human tissues (4 marks)
- iii. Medical biosensors (4 marks)
- iv. Drug delivery (4 marks)

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