



ELIZADE UNIVERSITY, ILARA-MOKIN,
ONDO STATE, NIGERIA
DEPARTMENT OF MECHANICAL ENGINEERING

FIRST SEMESTER EXAMINATION

2018/2019 ACADEMIC SESSION

COURSE: GNE 231 – Materials Science (3 Units)

CLASS: 200 Level General Engineering

TIME ALLOWED: 3 hrs

INSTRUCTION: Answer Any Five (5) Questions.

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HOD'S SIGNATURE

Date: March, 2019

QUESTION 1

- 1a) State Hooke's law and differentiate between young modulus, secant modulus, and tangent modulus. (4 marks)
- 1b) Differentiate between elastic and plastic deformation. (3 marks)
- 1c) Explain the stages metal subjected to load passes through before fracture and show them on stress/strain curve. (5 marks)

QUESTION 2

- (2a) What are dielectric materials and how are they characterize? (3 marks)
- (2b) Differentiate between Intrinsic and Extrinsic Semiconductors. (3 marks)
- (2c) How can Conductivity be expressed? Using the science of electron mobility and energy bands, differentiate between Conductor, Insulator and Semi-conductor. (6marks)

QUESTION 3

- (3a) Explain why ionically and covalently bonded materials are mostly electrical insulators. (2 marks)
- (3b) Draw the unit cells for the principal crystal structures of metal and give three examples of element that exhibit these structures. (4 marks)

- (3c) Derive the relationships between unit cell edge length and atomic radius for face-centered cubic and calculate the atomic packing factor for body centered cubic crystal structures. (6 marks)

QUESTION 4

- (4a) Explain crystal defect and give the detailed classification of defect. (4 marks)
- (4b) Explain Burger's vector and state three differences between edge dislocation and screw dislocation. (4 marks)
- (4c) Name four different types of steels and, for each, cite compositional differences and industrial application. (4 marks)

QUESTION 5

- (5a) Define heat treatment and State the procedure involved in carrying out metallographic study on a metal. (4 marks)
- (5b) Explain the stages of heat treatment (temperature/time graph required). (4 marks)
- (5c) Explain four (4) types of heat treatment. (4 marks)

QUESTION 6

- (6a) Describe the mechanism of crack propagation for both ductile and brittle modes of fracture. (6 marks)
- (6b) Define fatigue and specify the condition under which it occur (3 marks)
- (6c) Define creep and specify the condition under which it occur (3 marks)

QUESTION 7

- (7a) Explain corrosion and mention five of its consequences (4 marks)
- (7b) Distinguish between oxidation and reduction electrochemical reaction (3 marks)
- (7c) Explain five measures that are used to prevent corrosion. (5 marks)