ELIZADE UNIVERSITY, ILARA-MOKIN,
ONDO STATE, NIGERIA

DEPARTMENT OF

MECHANICAL, AUTOMOTIVE AND PRODUCTION ENGINEERING

FIRST SEMESTER EXAMINATIONS

2017/2018 ACADEMIC SESSION

HOD'S SIGNATURE

COURSE: GNE 231 – Materials Science (3 Units)

CLASS: 200 Level General Engineering

TIME ALLOWED: 2 Hours: 30 Min.

INSTRUCTIONS: Answer any **FOUR** questions

Date: March, 2018

Question 1

a) State Hooke's law and specify the condition under which it is valid (4 marks)
b) Explain elastic and plastic deformation (4 marks)
c) Explain using stress/strain curve, the stages metal subjected to load passes through before fracture. (7 marks)

Question 2

a) Explain corrosion and its consequences (4 marks)
b) Distinguish between oxidation and reduction in electrochemical reaction (4 marks)
c) Enumerate and explain briefly, five measures that are used to prevent corrosion. (7 marks)

Question 3

a) Describe the mechanism of crack propagation for both ductile and brittle modes of fracture (7 marks)
b) Define fatigue and specify the condition under which it occurs (4 marks)
c) Define creep and specify the condition under which it occurs (4 marks)

Question 4

a) Explain Hot working, Cold working and Heat treatment. (6 marks)
b) Explain the stages of heat treatment using the temperature/time graph (3 marks)
c) Explain the different types of heat treatment (6 marks)

Question 5

a) Explain crystal defect and give the detailed classification (5 marks)

b) (i) Explain Burger's vector

(ii) State the differences between edge dislocation and screw dislocation. (6 marks)

c) Name four different types of steels and, for each, cite compositional differences among them (4 marks)

Question 6

a) Derive the relationships between unit cell edge length and atomic radius for body-centered and calculate the atomic packing factor for face centered cubic cubic crystal structures. (8 marks)

b) Explain and draw the unit cells for the principal crystal structures (5 marks)

c) Describe the difference between crystalline and non-crystalline materials. (2 marks)