ELIZADE UNIVERSITY, ILARA-MOKIN,
ONDO STATE, NIGERIA

DEPARTMENT OF
MECHANICAL, AUTOMOTIVE AND PRODUCTION ENGINEERING

FIRST SEMESTER EXAMINATIONS

2017/2018 ACADEMIC SESSION

COURSE: MEE 311 – Physical Metallurgy (3 Units)

CLASS: 300 Level Mechanical Engineering

TIME ALLOWED: 2 Hours: 30 Min.

INSTRUCTIONS: Answer any **FOUR** questions

HOD'S SIGNATURE

Date: March, 2018

Question 1

1a. Define the following terms

i. Corrosion
ii. Creep
iii. Austenite
iv. Microstructure
v. Eutectic Temperature

1b. List and explain 5 different types of engineering materials.

(15 Marks)

Question 2

2a. Write short notes on the following

i. Case hardening
ii. Flame hardening
iii. Carburizing
iv. Cyaniding
v. Nitriding

bi. What is tempering?

ii. In two steps explain the procedure for tempering **(15 Marks)**

Question 3

3a. Explain briefly the term "Corrosion in steel".

b. State and explain 3 methods of rust prevention in steels.

c. List 5 alloying elements and their principal functions

(15 Marks)

Question 4

4a. Explain the term "Necking" during deformation of metals.

4b. List 4 causes of corrosion in metals.

4c. Explain briefly the Hall-Heroult method of Aluminium production.

(15 Marks)

Question 5

5a. List and explain three processes of work hardening.

b. From the equation below,

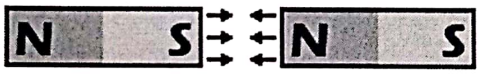
$$\varepsilon = A\sigma^{n}\exp\left(-\frac{Q}{RT}\right)$$

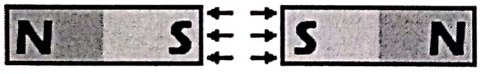
Determine A given that the activation energy is 500 KJ/mol at a steady creep rate of 2.5×10^{-5} s^{-1}. Take R = 8.3$Jmol^{-1}K^{-1}$ at an absolute temperature of 973K and stress component of 48.5MPa.

(15 Marks)

Question 6

6a. Using the figure below, explain briefly the science of the major characteristics of Magnets





b. Write short notes on the following

i. Temporary Magnets

ii. Permanent Magnets

c. Write short notes on the following alloys of copper

i. Brass

ii. Bronze

(15 Marks)