ELIZADE UNIVERSITY, ILARA-MOKIN, ONDO STATE, NIGERIA

DEPARTMENT OF AUTOMOTIVE ENGINEERING

SECOND SEMESTER EXAMINATIONS

2018/2019 ACADEMIC SESSION

HOD'S SIGNATURE

COURSE: ATE 502 – Automotive Materials & Structures (3 Units)

CLASS: 500 Level Automotive Engineering

TIME ALLOWED: 3 Hours

INSTRUCTIONS: Answer question **ONE (1)** and any other **FOUR (4)**

Date: July, 2019

Question 1 (12 MARKS)

(a) The shape and magnitude of the stress-strain curve of a metal will depend on the following except (*a*) heat treatment (*b*) strain rate (*c*) prior history of plastic deformation (*d*) change in length

(b) Which of the hardening technique allow surface and center cooling above martensite transformation region?

(c) What is the average weight of polymers used in typical car?

(d) Recrystallization to a fine grain size at an early stage may allow diffusive mass transfer processes to become dominant. True/False

(e) In material selection failure to start with full menu of material may result into what?

(f) In thermal spraying of metals, what is the cooling rate of the thin splats?

(g) What are hypoeutectoid steels?

(h) Bath temperature for zinc and aluminium coating in hot dipping must be maintained at what range?

(i) What is material kingdom?

(j) When the load exceeds a value corresponding to the yield strength, the specimen undergoes gross plastic deformation but does not permanently deformed if the load is released to zero. True/False

(k) What is the full meaning of FRP?

(l) Enumerate two microscopic technique used to determine the active deformation mechanism in materials

Question 2 (12 MARKS)

(a) Using the concept of a stress-strain relationship explain the behaviour of:
   (i) 2 mm thick hollow section having an outside diameter 25 mm,
   (ii) a solid section of 25 mm diameter, and
   (iii) what is the difference between (i) and (ii) above?

(b) How does the environment affect materials response to tensile or compression test?

(c) with the aid of a stress-strain diagram explain the difference in the behaviour of (i) brittle material (ii) Ideal ductile material (iii) ductile material (iv) semi ductile material

Question 3 (12 MARKS)

(a) What is corrosion as defined by ISO 8044-1986?

(b) (i) What is anticorrosion coating?
(ii) List five coating operation and explain three of them

Question 4 (12 MARKS)

(a) List and explain the three possible defects that may occur during heat treatment.

(b) A client brought Packets of textile needles to Elizade workshop for heat treatment. The motive was to reduce its decarburization. (i) What treatment approach will you recommend and why? (ii)Explain the processes involve.

Question 5 (12 MARKS)

(a) (i) What is CMC
(ii) Name the three processing techniques employed for the manufacture of CMC
(iii) Identify four advantages of CMC in the manufacture of car engines

(b) Enumerate 6 types of polymers and their area of application in automobile system

Question 6 (12 MARKS)

(a) List any six factors that can influence deformation mechanism.

(b) List the five deformation mechanisms and explain three of them.

Question 7 (12 MARKS)

(a) As a final year student, list and explain the four different steps required in selecting a Material for your final year project.

(b) The final selection of a material for any design will depend largely on its local condition, explain.