071906T4AEN

AGRICULTURAL ENGINEERING LEVEL 6

ENG/OS/AGR/CC/06/6/A

APPLY MATERIAL SCIENCE AND METALLURGICAL PROCESSES

July /August 2024

TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION COUNCIL (TVET CDACC)

WRITTEN ASSESSMENT

3 HOURS

INSTRUCTIONS TO CANDIDATE

1. This paper consists of two sections; **A** and **B**
2. Answer **ALL** the questions as guided in each section
3. Marks for each question are as indicated in the brackets
4. You are provided with a separate answer booklet to answer the questions
5. Do not write in this question paper

This paper consists of FOUR (4) printed pages

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing

SECTION A: (40 Marks)

*Answer **ALL** questions from this section*

1. State **four** properties of non-ferrous alloys (4 marks)
2. Define the following terms as used in ore extraction (4 marks)
   (a) Pyrometallurgy
   (b) Hydrometallurgy
3. Outline **four** properties of ceramics that make them useful in modern world (4 marks)
4. State **four** characteristics of ferrous alloys materials that make them extensively used. (4 marks)
5. Highlight **four** factors for classification of materials used engineering (4 marks)
6. State **four** reasons for tensile test (4 marks)
7. Highlight **four** functions of matrix materials as used in a composite. (4 marks)
8. Highlight **four** reasons why one may prefer grey cast iron than white cast iron. (4 marks)
9. Distinguish between these methods of preventing corrosion. (4marks)
   (a) Galvanizing:
   (b) Cathodic protection
10. Outline **four** general properties of polymers (4 marks)

SECTION B: (60 Marks)

*Answer **ANY THREE** Questions from This Section*

11.

a)

i). Highlight **four** safety precautions to be observed during ore extraction process (4 marks)

ii). Describe **six** the steps involved in iron ore extraction (6 marks)

b) Describe **five** Physical properties of materials that affect material selection (10 Marks)

12. With the aid of a well labelled diagram, describe the operation of a blast furnace (20 marks)

13.

a) Highlight **two** reasons why it is important to study mechanical properties of materials. (2 marks)

b) Describe these mechanical properties as seen in engineering materials (10 marks)

i). Fatigue
ii). Hardness
iii). Toughness
iv). Malleability
v). Creep

c) Explain **four** differences between FCC and BCC crystal structures (8marks)

14.

a) Explain the meaning of these terms as used in heat treatment; (4 marks)

i). Soaking
ii). Solid solution

b) Explain how these heat treatments are carried out and their importance in metallurgy. (4 marks)

i). Tempering
ii). Normalizing

c) Define the term composites? (2 marks)

d) Explain **five** factors that affect the structure of cast iron? (10 marks)

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