THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

092 WORKSHOP TECHNOLOGY

(For Both School and Private candidates)

Time: 3 Hours **Year: 2022**

Instructions

1. This paper consists of section **A**, **B** and **C** with total of f**ourteen (14)** questions.
2. Answer **all** questions in section **A** and **B**, and **three (3)** questions from section **C.**
3. Section **A** carries **ten (10)** marks , section **B,** and C carry **forty five (45)** marks each.
4. Cellular phones, and any unauthorized materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet (s).

SECTION A (10 marks)

Answer **all** questions in the section

1. Choose the correct answer for each item (i) to (x) and write its letter in the answer booklet provided.

i) What gives the possibility of cutting grey cast iron without using cutting fluid?

A. The presence of pearlite
B. The presence of fine ferrite
C. The presence of iron carbide
D. The presence of graphite
E. The presence of Sulphur

ii) Which of the following is the result of hot rolling process?

A. Improvement of surface finish
B. Increased density of metal
C. Improvement of ductility of metal
D. Improvement of fusibility
E. Increased dimensional accuracy.

iii) Suppose you are working in a heat treatment workshop and a steel shaft with soft core and hard outside skin is required. Which process will you use to modify mild steel to suit the purpose?

A. Normalizing
B. Carburizing
C. Hardening
D. Tempering
E. Annealing

iv) Which method of material testing suitable for determining the deformation of material at constant load below its yield strength?

A. Creep testing

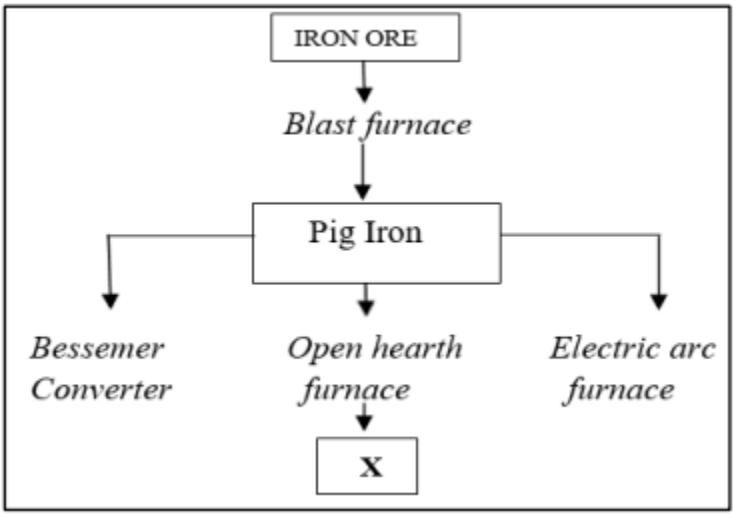
B. Tensile testing

C. Compression testing

D. Fatigue testing

E. Hardness testing.

v) What is the product represented by letter X in Figure 1?



A. Blister steel

B. Tool steel

C. Shear steel

D. Crucible steel

E. General purpose steel

vi) What is the function of silicon in cast iron?

A. To promote graphite nodule formation and improve the ductility of cast iron.

B. To promote graphite flake formation and increase fluidity of the molten metal.

C. To promote graphite nodule formation and increase fluidity of the molten metal.

D. To increase fluidity of the molten metal and improve the ductility of

cast iron.

E. To increase graphite flake formation and improve the ductility of cast iron.

vii) Which of the following processes is used to make bottles from thermoplastic materials?

A. Compression molding
B. Extrusion
C. Injection molding
D. Blow molding
E. Transfer molding.

viii) Suppose you are a technician working in the factory which produces cutting tools e.g drills, saws and milling cutters; what type of material will you order for that purpose?

A. High speed steel
B. High carbon steel
C. Cast iron
D. Mild steel
E. Silver steel.

ix) A candidate used a center punch to mark a hole on the cemented carbide surface but failed. What could be the reason for the failure?

A. The surface was too slippery
B. The surface was casted
C. The surface was too big in size
D. The center punch blunt
E. The surface was harder than the center punch.

x) Which term denotes a system of assembling a number of unit components taken at random from stock so as to build up a complete mechanism or machine?

A. Tolerance
B. Allowance
C. Interchangeability
D. Serviceability
E. Deviation.

SECTION B (45 marks)

Answer **all** questions from this section

2. (a) Classify metal heating furnace according to the fuel used.
   (b) Mention two instruments used to measure furnace temperatures.
3. Explain why cast iron is extensively used in industries for making various machine parts.
4. (a) Explain three factors they will consider in order to select appropriate materials for a particular work in mechanical engineering.
   (b) Classify the engineering materials into two main groups.
5. (a) What alloys are formed by the combination of the following metal?
   (i) 60%tin, 10%antimony, 1.5% copper and 28.5% lead
   (ii) 88% copper, 10% tin and 2% zinc
   (iii) 65%tin and 35%lead

   (b) What type of alloying element is required in each of the following cases?
   (i) Alloying with steel to obtain material; for making excavator bucket for earth moving machine.
   (ii) Alloying with steel to make it cut other metals at high temperatures.
6. (a) Explain thecolour codes indicated in metal identifiedbyblue, yellow and red colour and in (b) Decide the correct appearance colours of the high speed steel and copper materials.

7. Explain five advantages of using chemical cutting fluids.
8. (a) Explain the three methods used for heating steel during case hardening.
   (b) Give the advantage of using air as a quenching medium in heat treatment.
9. (a) Explain three techniques in assembling the components if the hole and the shaft are made with interference fit.
   (b) State the uses of plug and snap gauges.
10. Explain the behavior of a metalhaving the following properties:
    a) Toughness
    b) Ductility
    c) Malleability
    d) Brittleness
    e) Elasticity.

SECTION C (45 marks)

Answer any **three (3)** questions from this section

11. (a) Explain the following material as usedin production of cast iron;
    (i) limestone
    (ii) coke
    (iii) iron ore
    (iv) scraps of steel.
    (b) Explain the processes carried out in the production of metals:
    (i) casting of metals (ii) rolling of metals.
    (c) Determine four types of iron ores found in the earth crust.
    (d) Explain two commonmethods used in extracting (mining) iron ores in the earth crust.

12. Explain with the aid of heat and cooling curve sketch the changes of metal characteristics that take place when steel is heated to $900^{o}C$ and allowed to cool.

13. (a) Explain the negative effect of cutting steel material with insufficient supply of cutting lubricant.

    (b) Give a brief explanation of three methods which are used to supply lubricating oil to different parts of machines which requires lubrication.

    (c) Explain the procedure of applying coolant in metal cutting carried out on

        (i) flooding

        (ii) dripping

        (iii) misting.

14. (a) Explain three main types of fits used in assembling metal parts.

    (b) Use hole and shaft dimensions to determine:

        (i) hole tolerance,

        (ii) shaft tolerance

        (iii) allowance of the fit.

    (c) Explain types of fit established in part (b).