KT

THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

092

WORKSHOP TECHNOLOGY
(For Both School and Private Candidates)

Time: 3 Hours **Thursday, 10th November 2016 a.m.**

Instructions

1. This paper consists of sections A, B and C.
2. Answer **all** questions in section A and B and **three** (3) questions from section C.
3. Calculators and cellular phones are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

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SECTION A (10 Marks)

Answer **all** questions in this section.

1. For each of the items (i) – (x), choose the correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided.

(i) The furnace for converting iron ore into pig iron is called
- A bessemer converter
- B blast furnace
- C open hearth furnace
- D basic oxygen furnace
- E crucible furnace.

(ii) Which of the following is a ferrous material?
- A Zinc
- B Limestone
- C Silicon carbide
- D Iron
- E Copper.

(iii) Free machining steel is a category of steel which
- A does not require machining
- B can be machined without lubricant
- C is easily machined
- D has been forged
- E has least amount of material to be machined.

(iv) Greases are classified according to stiffness on a scale of
- A 0 (stiffest) to 10
- B 0 (stiffest) to 6
- C 0 (stiffest) to 100
- D 0 (stiffest) to 100
- E 0 (stiffest) to 50.

(v) Which of the following is the quenching fluid that cools most rapidly?
- A Plain water
- B Molten salt
- C Oil
- D Air
- E Brine and caustic.

(vi) Which of the following is used as a physical property to identify metals by virtue of their ability to reflect light?
- A Reflectivity
- B Color
- C Luster
- D Refractive index
- E Absorptivity.

(vii) Impact strength and stiffness are the properties of materials known as
- A mechanical properties
- B chemical properties
- C thermal properties
- D physical properties
- E optical properties.

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(viii) What kind of fit is represented by the motion of a piston in the cylinder of an engine?

A Running fit
B Sliding fit
C Location fit
D Force fit
E Shrink fit.

(ix) The temperature at which new grains are formed in a metal is called

A lower critical temperature
B upper critical temperature
C eutectic temperature
D recrystalization temperature
E melting temperature.

(x) Which lubricant is suitable for lubricating sliding parts of machines?

A Soapy water
B Whale oil
C Low viscosity oil
D Mixture of paraffin and oil
E Grease.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. Outline three properties that make non-ferrous metal a useful engineering material.
3. Distinguish between pig iron and wrought iron.
4. Why alloying elements are added to steel?
5. List down three processes of carburizing.
6. It is important that hardened steel be tempered soon after hardening. Give reasons.
7. How would you identify the following metals to their colour?
   (a) Alluminium
   (b) Brass
   (c) Copper
8. Define the following limit and fit terms:
   (a) Deviation
   (b) Limits of size
   (c) Clearance.
9. What effects do silicon, sulphur and phosphorus have to cast iron?
10. Give three uses of tin.
11. Mention two types of pyrometers used for measuring furnace temperature.

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SECTION C (60 Marks)

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

12. (a) Name the products of blast furnace and their uses. **(08 marks)**

(b) Give the effects of the following alloying elements to steel:
(i) Chromium
(ii) Manganese
(iii) Nickel. **(06 marks)**

(c) Name the elements which are combined to form the following metals:
(i) Brass
(ii) Bronze
(iii) Gun-metal. **(06 marks)**

13. (a) What are the factors that lead to the decision of using oil or grease for lubrication? **(10 marks)**

(b) Explain the methods of applying lubricants in machine parts. **(06 marks)**

(c) What are the defects which may develop when oil in a machine has been in use for a long time under warm conditions? **(04 marks)**

14. (a) State six precautions which should be considered when immersing heated parts or tools in a quenching liquid. **(12 marks)**

(b) Distinguish between annealing and normalizing of steel. **(08 marks)**

15. The designation of a fit is given as 110 K7 /h6, where K7/h6 = $\frac{+0.010}{-0.025}$ / $\frac{0.00}{-0.035}$

(a) Name the basis system and type of fit of the destination. **(02 marks)**
(b) Write the hole and shaft allowances. **(08 marks)**
(c) Calculate the tolerances for the hole and shaft. **(04 marks)**
(d) Calculate the limits. **(02 marks)**
(e) Calculate the maximum clearance and interference. **(04 marks)**

16. (a) Why metals are better conductors of electricity than ceramics and polymers? **(03 marks)**

(b) What are the three classifications of ceramic materials according to common characteristic or features? **(03 marks)**

(c) (i) Mention four components which are made out of high speed steel material.
(ii) Enumerate four mechanical properties of metals? **(10 marks)**

(d) What are the two categories of metal testing methods? **(04 marks)**

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