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 ***Wednesday 12th October 2011 a.m.***

Instructions

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

This paper consists of 4 printed pages.

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.

(i) Wrought iron is manufactured in
A a cupola furnace B a Bessemer converter C an open hearth furnace
D an electric furnace E a puddling furnace.

(ii) Which of the following iron ore has the highest percentage of iron?
A limonite B pearlite C magnetite D cementite E taconite.

(iii) What is the name given to the process of obtaining pig iron from the blast furnace?
A Refining B Smelting C Melting D Reduction E Thermo- melting.

(iv) Which of the following represents a group of bearing metal?
A Copper –base bearing metals containing tin, copper and lead
B Lead –base bearing metals containing copper, tin and lead
C Cadmium –base bearing metals containing cadmium, nickel and lead
D Aluminium –base bearing metals containing aluminium, tin and lead
E Tin –base bearing metals containing copper, tin and lead.

(v) Which of the following is the correct order in which taps should be used when tapping a hole?
A Plug, Intermediate and taper B Taper, Intermediate and plug
C Taper, plug and Intermediate D Intermediate, taper and plug
E Intermediate, plug and taper.

(vi) The composite of a gun metal is the
A Brass alloyed with Zinc and Lead B Steel alloyed with Zinc and Lead
C Copper alloyed with Tin and Zinc D Copper alloyed with Zinc and Lead
E Bronze alloyed with Zinc and Lead.

(vii) The property of a material by virtue of which deformation caused by applied load disappears upon removal of the load is called
A Ductility B Elasticity C Malleability D Brittleness E Plasticity.

(viii) Which of the following are non metal materials?
A brass, timber and coppice B wood, brass and rubber
C Plastic lumber and silicon D silicon, coppice and rubber
E Timber, lumber and plastic.

(ix) What is the property of steel when alloyed with cobalt?
A Soft and disable to retain cutting edge
B Brittle and able to retain cutting edge
C Hard and able to retain cutting edge
D Weak and disable to retain cutting edge
E Strong and able to retain cutting edge.

(x) Some of the steel alloying elements are
A manganese, copper and chromium
B magnetite, nickel and vanadium
C nickel, magnetite and aluminium
D vanadium, nickel and manganese
E manganese, copper and magnetite.

SECTION B (30 Marks)

Answer **all** questions in this section.

2. Explain the following properties of metals:
(a) Brittleness (b) Ductility (c) Malleability.

3. What are the chief ores of the following metal?
(a) Zinc (b) Copper (c) Lead.

4. Mention six safety precautions to be observed in the workshop.

5. Enumerate the main charges required for the production of pig iron.

6. Give the range of carbon content in the following metals.
(a) Medium carbon steel (b) Mild steel (c) Tool steel.

7. What are the cutting fluids to be applied when drilling the following materials?
(a) Manganese (b) Magnesium (c) Alloy steels.

8. State three properties of cutting fluids.

9. (a) What is Smithing?
(b) Define the following as refers to engineering materials.
(i) Non-ferrous metal.
(ii) Ferrous metal.

10. (a) Define flux as used in soldering process.
(b) Enumerate two groups of plastics.

11. State three distinctive stages that may be noted in the conversion of pig iron to steel in Bessemer furnace.

SECTION C (60 Marks)

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

12. (a) What is heat treatment of steel? **(02.5 marks)**
    (b) With the aid of sketch, analyse the 'purpose' and 'procedure' of the following heat treatment processes.
        (i) Annealing.
        (ii) Nitriding.
        (iii) Normalising.
        (iv) Tempering. **(17.5 marks)**

13. (a) Describe four forging operations as practiced in the workshop. **(10 marks)**
    (b) Account for five groups of the cutting fluid. **(10 marks)**

14. (a) Explain how cast iron is produced.
    (b) Describe how the following types of cast iron are produced and state their properties and uses. **(05 marks)**
        (i) Grey cast iron.
        (ii) White cast iron.
        (iii) Malleable cast iron. **(15 marks)**

15. (a) (i) What is the purpose of 'testing the metals' in Mechanical engineering?
        (ii) Illustrate four methods of non - destructive tests. **(12.5 marks)**
    (b) What is the 'rolling of metals' with regard to workshop processes? **(02.5 marks)**
    (c) Explain how do the following rolling practices are carried out in the workshop?
        (i) Cold rolling.
        (ii) Hot rolling. **(05 marks)**

16. (a) Explain the following with regard to interchangeability.
        (i) Hole basis system.
        (ii) Shaft basis system. **(05 marks)**

    (b) With the aid of sketches showing the maximum and minimum allowance, describe the three (3) types of fits.
        (i) Clearance fit.
        (ii) Transition fit.
        (iii) Interference fit. **(10.5 marks)**

    (c) Given that, the hole dimensions are 25.02 and 25.00 mm with maximum and minimum clearances of 0.06 and 0.02 respectively.
        (i) Compute the shaft dimensions.
        (ii) Sketch and label the dimensions of hole and shaft. **(04.5 marks)**