Student's Assessment Number.....

THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

FORM TWO NATIONAL ASSESSMENT

090 MECHANICAL ENGINEERING

Time: 2:30 Hours **Year: 2023**

Instructions

1. This paper consists of sections **A, B** and **C** with a total of **ten (10)** questions**.**
2. Answer **all** questions.
3. Section **A** and **C** carry **fifteen (15)** marks each, section **B** carries **seventy (70)** marks.
4. Cellular phones and any unathorized materials are **not** allowed in the assessmenmt room.
5. Write your **Assessment Number** at the top right hand corner of every page.

FOR ASSESSOR'S USE ONLY		
QUESTION NUMBER	**SCORE**	**ASSESSOR'S INITIALS**
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
TOTAL		
CHECKER'S INITIALS		

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SECTION A (15 MARKS)

Answer **all** questions in this section

1. Choose the correct answer from the given alternatives and write its letter in the box provided.

(i) Which types of Chisels are used for chipping away materials from the workpiece?

A. Flat, round, square and diamond point

B. Flat, cross cut, diamond point and square

C. Flat, cross cut half round and diamond point

D. Hollow, flat and pin chisel.

(ii) Which metals fall under ferrous metals group?

A. Steel, Copper and Tin

B. Pig iron, Brass and Cast iron

C. Pig iron, Steel and Cast-iron

D. Cast iron, Brass and Steel

(iii) The tendency of materials to develop different characteristic behavior when subject to fluctuating or repeated loads is known as;

A. Fatigue

B. Resilience

C. Creep

D. Stiffness

(iv) Drill bit is the cutting tool which facilitates the making of a hole in the workpiece. Which part pass chips during cutting operation?

A. Heel

B. Shank

C. Flute

D. Pitch

(v) Which material of hacksaw blade is appropriate for cutting a revolving or stationary work piece?

A. High tungsten steel

B. High carbon steel

C. Carbide tool steel

D. High speed steel

(vi) Suppose you are assigned to cut the given metallic components: round bar with $\emptyset 20\ mm$, black pipe $\emptyset 25\ mm$ and flat bar having thickness of $6\ mm$, which appropriate tool will you select for the job?

A. Power hacksaw machine

B. Hand hacksaw

C. Cold chisel

D. Shear machine

(vii) What appropriate type of furnace is required to be installed first in order to make mass production of steel for industrial use?

A. Bessemer process

B. Open-heath process

C. Steel making process

D. Manufacturing process.

(viii) Which set of elements are found in the process of producing pig iron by smelting iron ore in the blast furnace?

A. Magnesium, manganese, sulphur, chromium and carbon

B. Carbon, silicon, manganese, sulphur and phosphorus

C. Sulphur, phosphorus, manganese and magnesium

D. Chromium, carbon, sulphur, silicon and phosphorus.

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(ix) Which one of the following can be the uses of a divider?

A. Reading the arc, measuring and dividing the line

B. Dividing the arc, reading and transferring measurement

C. Transferring measurement and dividing the are

D. Marking arcs, dividing a line and transferring dimensions

(x) Why is it necessary to colour the coding in fire extinguisher?

A. For its quick identification and rust prevention

B. For preventing misuse and attractiveness

C. For inspection and reflectiveness

D. For quick identification and reflection.

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2. Match the properties of engineering material in **List A** with the corresponding metallic element in **List B** by writing a letter of the correct response in the table provided.

LIST A	**LIST B**
(i) It increases the elasticity, strength at high temperature and machinability of steel. (ii) It resists wear and corrosion, increases toughness and hardness of steel. (iii) It is toughened and strengthen steel, fatigue and wear resistant (iv) It promotes hot shortness and weakens steel by marking brittle (v) It promotes cold shortness, increases strength and resists corrosion	A. Vanadium B. Manganese C. Phosphorus D. Molybdenum E. Chromium F. Carbon G. Silicon H. Sulphur

List A	(i)	(ii)	(iii)	(iv)	(v)
List B					

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SECTION B (70 MARKS)

Answer **all** questions from this section

3. A $60\ mm\ x\ 50\ mm\ x\ 8\ mm$ mild steel bar is to be filed, hacksawed and drilled during workshop practice.

   (a) Briefly explain six operational sequences in order to accomplish the work.

   (i) …….

   (ii) ……..…….

   (iii) ……..…

   (iv) ……..….

   (v) ……

   (vi) ……..….

   (b) What are the four precautions to be taken into account during the work operation?

   (i) …….

   (ii) …….

   (iii) ……..

   (iv) ……..…….

4. Suppose you were assigned to do safety assessment in school workshop and you observe that there were many accidents caused by mechanical and human errors. Briefly explain five mechanical causes of accident and five human causes.

   (a) Mechanical causes

   (i) …….

   (ii) ……..…….

   (iii) ……..…

   (iv) ……..….

   (v) ……

(b) Human error causes

(i) …….

(ii) ……..…….

(iii) ……..…

(iv) ……..….

(v) ……

5. (a) The process of joining two metals using gas welding can be done either by fusion or non-fusion welding process. What makes these two processes differ from each other?

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(b) Briefly explain five procedures you will follow in order to shut down a gas plant after finishing welding activity.

(i) …….

(ii) ……..…….

(iii) ……..…

(iv) ……..….

(v) ……

6. (a) Give two advantages and two disadvantages of Direct Current Straight Polarity (DCSP) and Direct Current Reverse Polarity (DCRP) welding processes.

Advantages and two of Direct Current Straight Polarity (DCSP)

(i) …….

(ii) ……

Disadvantages Direct Current Straight Polarity (DCSP)

(i) …….

(ii) ……

Advantages of Direct Current Reverse Polarity (DCRP)

(i) …….

(ii) ……

Disadvantages Direct Current Reverse Polarity (DCRP)

(i) …….

(ii) ……

(b) With the help of well labelled sketch diagram, explain how you will connect your workpiece from arc welding power supply source to get a Direct Current Straight Polarity (DCSP).

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Sketch:

7. (a) Why is it important to establish safety and health programmes in industries? Give four benefits.

(i) …….

(ii) ……..…….

(iii) ……..…

(iv) ……..….

(b) What are the six personal safety precautions you should practice in order to avoid injuries in machine shop?

(i) …….

(ii) ……..…….

(iii) ……..…

(iv) ……..…….

(v) ……

(vi) ……..

8. (a) Briefly explain the term 'marking out' as used in bench workshop

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(b) You have been assigned to mark steel plate to be drilled. Give eightt operations procedure you will follow to accomplish the task.

(i) . …….

(ii) ……..…….

(iii) ……..…

(iv) ……..…….

(v) ……

(vi) ……..

(vii) …….

(viii) …….

9. (a) Briefly explain the term 'fusion welding' as applied in gas welding process.

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(b) What are the four advantages and four disadvantages of fusion welding?

(i) Advantages of fusion welding

(i) . . …….

(ii) ……..…….

(iii) ……..…

(iv) ……..…….

(ii) Disadvantages of fusion welding

(i) …….

(ii) ……

(iii) ……..

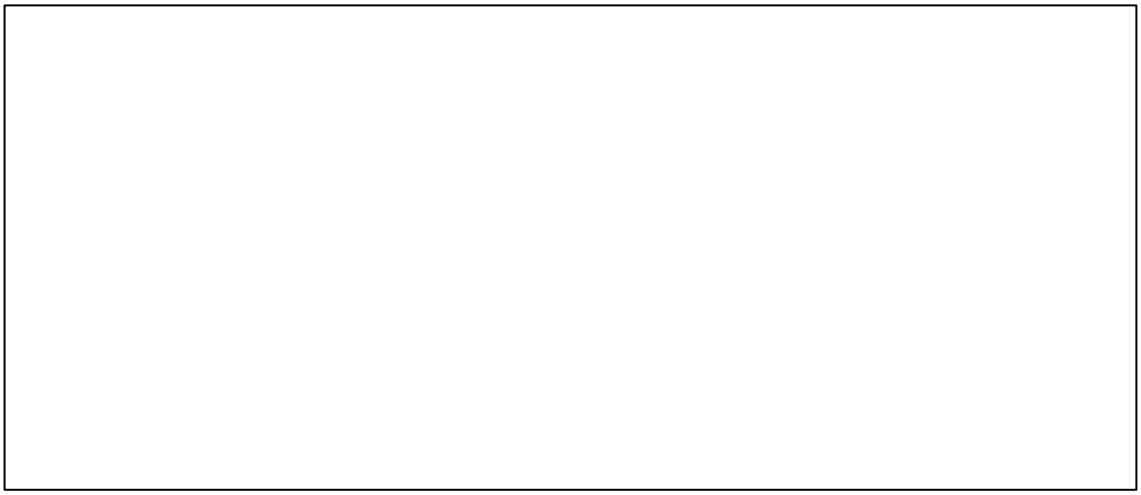
(iv) …….

SECTION C (15 MARKS)

Answer **all** questions from this section

10. (a) Hammer is one of the common tools used in workshop to facilitate various activities. Sketch the head of the given types of hammer and state one use for each.

(i) Straight pein hammer



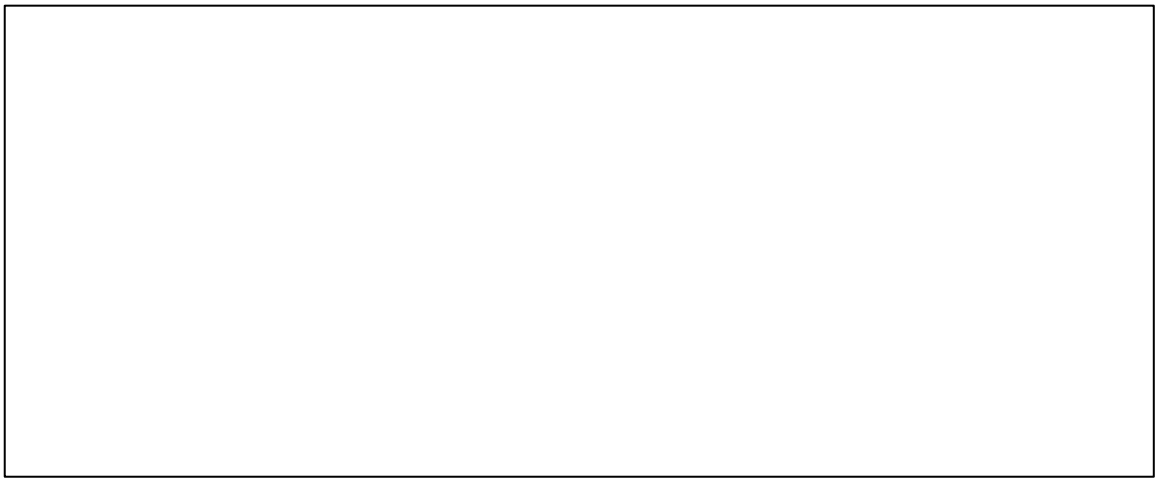
Uses:

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(ii) Planishing hammer



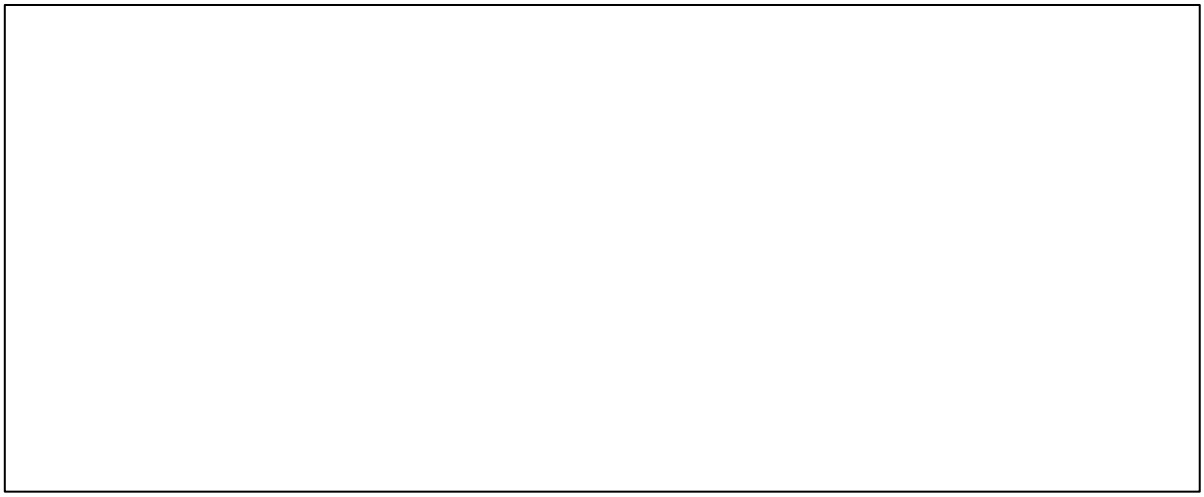
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(iii) Blocking hammer



Uses:

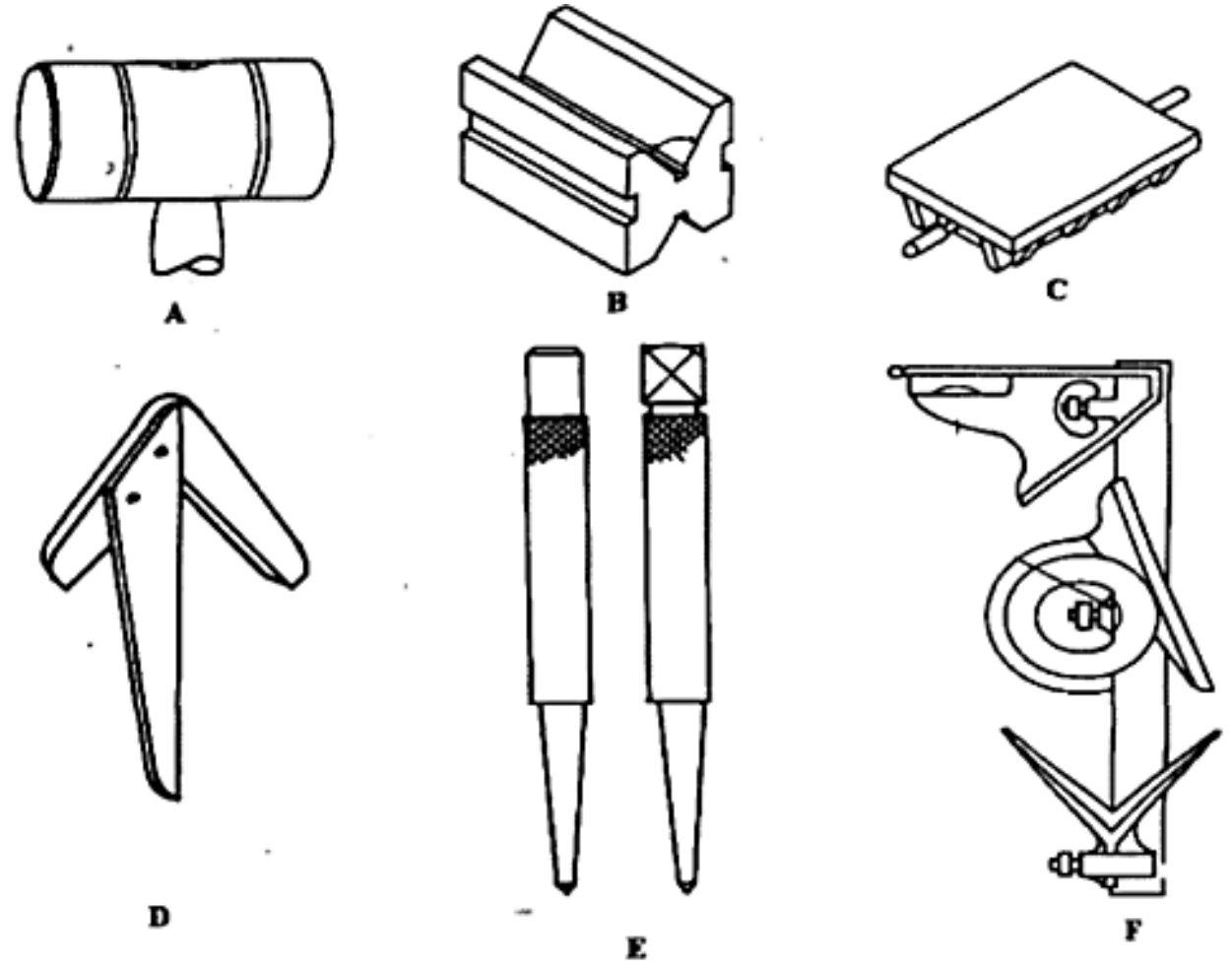
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(b) The figure below shows different types of tools and equipment used in bench workshop labeled with letters A to F. Identify the tools, material used to make them and two applications of each tool.



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Tool A:

Name:

……..……..

Material made

…….

Application

(iv) ……

(v) ……..……..

Tool B:

Name:

……..……..

Material made

…….

Application

(i) ……..……

(ii) ……..……..

Tool C:

Name:

……..……..

Material made

…….

Application

(i) ……

(ii) ……..……..

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Tool D:

Name:

……..……..

Material made

…….

Application

(i) ……

(ii) ……..……..

Tool E:

Name:

……..

Material made

…….

Application

(i) ……..……

(ii) ……..……...……..

Tool F:

Name:

……..

Material made

…….

Application

(i) ……..…

(ii) ……..……...