THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

789 METAL WORKING AND MECHANICAL PRACTICE

Time: 3 Hour. **Monday, 10th May 2004 a.m.**

Instructions

1. This paper consists of **eight (8)** questions.
2. Answer any **five (5)** questions.
3. Each question carries **twenty (20)** marks.
4. Non-programmable calculators may be used.
5. Communication devices, programmable calculators and any unauthorized materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

1. (a) Define the term “layout work” in mechanical bench operations.

   (b) Explain four purposes of layout work in metal fabrication.

   (c) Describe the use of the following layout tools:

      (i) Surface gauge

      (ii) Scriber

      (iii) Steel rule

      (iv) Try square

   (d) Give three reasons why layout lines may be inaccurate in workshop practice.

2. (a) Describe the function of the bench grinder in a metal workshop.

   (b) (i) List three types of grinding wheels based on material composition.

      (ii) State two safety measures when using a bench grinder.

   (c) Explain the importance of dressing a grinding wheel before use.

   (d) State four defects that may occur if a grinding wheel is improperly used.

3. (a) Define the term “mechanical measurement” and state its importance in fitting work.

   (b) Explain the following measurement instruments and their uses:

      (i) Micrometer screw gauge

      (ii) Steel tape

      (iii) Dial gauge

      (iv) Vernier height gauge

   (c) State three possible causes of inaccuracy when using measuring tools.

   (d) Give four precautions to observe when storing and handling precision instruments.

4. (a) Explain the purpose of using jigs and fixtures in mechanical operations.

   (b) (i) State two advantages of using jigs over manual layout.

      (ii) Describe two differences between jigs and fixtures.

   (c) State four operations that require the use of jigs and fixtures in fitting and fabrication.

   (d) Explain two consequences of using damaged or worn-out jigs.

5. (a) Define the term “lathe accessories” and explain their purpose in turning operations.

   (b) Describe the use of the following lathe accessories:

      (i) Chuck

      (ii) Faceplate

      (iii) Centres

      (iv) Tool post

   (c) State three precautions when mounting a workpiece on a lathe.

   (d) Explain four causes of inaccuracy during a turning process.

6. (a) Explain the difference between drilling and boring.

   (b) (i) State three types of drill bits and their applications.

      (ii) Describe the function of a counterbore tool.

   (c) Explain the importance of centre punching before drilling.

   (d) List four factors that determine the choice of drill speed during an operation.

7. (a) Define the term “heat treatment” and explain its purpose in metalworking.

   (b) Describe the following heat treatment processes:

      (i) Annealing

      (ii) Hardening

      (iii) Tempering

      (iv) Normalizing

   (c) State two differences between hardening and tempering.

   (d) Explain three effects of improper heat treatment on mechanical components.

8. (a) Explain what is meant by “work hardening” in metal processing.

   (b) (i) Give three ways in which work hardening affects the metal properties.

      (ii) Describe two methods used to relieve work hardening effects.

   (c) State three safety measures to follow during work hardening processes.

   (d) Explain two advantages and two disadvantages of work hardening in mechanical operations.