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, 14th May 2001 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) (i) Define the term “workshop safety” in the context of mechanical operations.

(ii) List five general safety rules that must be observed in a mechanical workshop.

(b) Explain how the centre punch is used in marking out procedures and give two types of centre punches.

(c) (i) State three precautions to be taken when using a hammer in fitting work.

(ii) Give four different types of hammers and explain their uses in mechanical fitting.

2. (a) Outline four procedures involved in the preparation of surfaces before marking out a metal workpiece.

(b) Identify three common layout tools used in fitting and explain the use of each.

(c) Describe the following parts of a scribing block:

(i) Scriber

(ii) Column

(iii) Base

(iv) Fine adjustment screw

(d) With the help of a sketch, show the position of a scribing block in use.

3. (a) Describe four methods used in joining metals by mechanical means.

(b) Explain four advantages of riveted joints over welded joints.

(c) State two disadvantages of using nuts and bolts in assembling metal structures.

(d) Explain the function of the following components in a bolted joint:

(i) Washer

(ii) Nut

(iii) Bolt

(iv) Locking device

4. (a) Define the term “tapping” as used in mechanical workshop.

(b) (i) Differentiate between taper tap and plug tap.

(ii) State two precautions to take when tapping an internal thread by hand.

(c) Sketch and label a standard tap set and show the direction of cutting rotation.

(d) Give five possible causes for thread defects when tapping holes manually.

5. (a) Explain the differences between single point cutting tools and multipoint cutting tools.

(b) Describe the cutting action of a twist drill during drilling operation.

(c) Identify three types of drilling machines and state one use of each.

(d) State five safety precautions to be followed when operating a drilling machine.

6. (a) With the help of a sketch, describe the function of a lathe machine.

(b) Name four main parts of a centre lathe and explain the function of each part.

(c) Outline five procedures for turning a mild steel bar to required diameter on a lathe.

(d) Give four common faults encountered in turning and explain the causes of each.

7. (a) (i) Define the term "cutting fluid" and explain its importance in machining.

(ii) State four properties of a good cutting fluid.

(b) A steel bar is turned at 500 rpm using a tool with 90 mm diameter. Calculate the cutting speed.

Take $\pi = 3.142$.

(c) Outline four factors to be considered when selecting a cutting tool for turning operation.

(d) Calculate the feed per minute if the feed per revolution is 0.2 mm/rev and the spindle speed is 250 rpm.

8. (a) Explain how to recondition a dull twist drill for effective performance.

(b) What are the four major causes of drill breakage in operation and how can each be avoided?

(c) (i) Explain the function of a jig in drilling operations.

(ii) Describe how a drill jig differs from a drill fixture.

(d) Give the purpose of each of the following in precision drilling:

(i) Spot drilling

(ii) Centre drilling