# THE UNITED REPUBLIC OF TANZANIA
# NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
# DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

## 789 METAL WORKING AND MECHANICAL PRACTICE (SUPPLEMENTARY)

**Time: 3 Hours** **Year: 2020**

### 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 unauthorised materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

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1. (a) Briefly explain the purpose of the electrode holder used in electric arc welding.
   (b) Give six functions of the electrode coating.
   (c) Draw neat sketches to show the following effects of an electric current in arc welding:
      (i) Too low electric current
      (ii) Too high electric current
      (iii) Correct electric current.

2. (a) Explain the application of the following bench work tools:
      (i) Draw files
      (ii) Precision files
      (iii) Scrapers
      (iv) Center punch
      (v) Divider.
   (b) (i) Give the meaning of the letter and numbers in the expression M 4 x 0.7.
      (ii) How acid method helps to remove a broken piece of tap in a metal?
      (iii) Briefly explain how a tap extractor is used?
   (c) Give two purposes of broaching in the workshop.

3. (a) With the aid of sketches, differentiate parallel shank from taper shank of a twist drill.
   (b) How are conical or tapered heads of bolts and screws fitted correctly with the surface of the metal?
   (c) Explain the following terms as applied in hole making:
      (i) Reaming
      (ii) Fluted reamer
      (iii) Hand reamer
      (iv) Expanding reamer.
   (d) (i) With the aid of a sketch, explain the techniques of sharpening a reamer.
      (ii) What are the three important points to follow in the procedure of hand reaming?

4. (a) (i) Explain the term brazing as used in metal joining.
      (ii) How does the technique used in brazing assist the flow of flux and molten filler metal?
      (iii) Why is it necessary to wear goggles during brazing?
   (b) (i) Suggest the precautions that should be observed to avoid danger of explosions at the situation of brazing tanks which initially contained inflammable materials.
      (ii) What does it mean by angle of contact $\theta$, as used in braze welding?
   (c) Explain the importance of the following gears in soldering:
      (i) Soldering gun
      (ii) Flux
      (iii) Filler rods.

5. (a) Describe the following metal cutting tools:
   (i) Files
   (ii) Grinder
   (iii) Chisels
   (iv) Reamers.
   (b) (i) Differentiate chipping from shearing as applied in metal working.
   (ii) What is counter sinking in relation to counter boring?
   (c) Explain the occurrence of pinning and show how filings can be removed.
   (d) Describe taps and dies as cutting tools.

6. (a) (i) Briefly explain two categories of metal testing methods.
   (ii) For each of sheet metal, a drawn wire, engine block and rubber parts identify one essential property that enables it to be produced.
   (b) (i) Elaborate the four applications of annealing in mechanical component production.
   (ii) Account for the hot piercing as applied in manufacturing of mechanical components.
   (c) Explain the purposes of the following processes as used in sheet metal works:
   (i) Planishing
   (ii) Hollowing or blocking.

7. (a) (i) Briefly describe three types of calipers used in the workshop.
   (ii) There are eight divisions of 1mm and one subdivision of 0.5mm visible on main scale. The $15^{th}$ division of the thimble also coincides in the datum line. Find the reading of the micrometer.
   (b) Explain the five basic precautions to be observed by anyone who uses a vernier caliper.
   (c) (i) Differentiate between measurement and gauging.
   (ii) Give the important characteristics for surface of gauges that are used in workshop.

8. (a) Briefly explain the processes of cutting external threads by using the followings:
   (i) Hand tools
   (ii) Lathe machine.
   (b) Give the meaning of the following terms in relation to thread cutting:
   (i) A flank
   (ii) Depth of thread
   (iii) The number of threads
   (iv) Lead.
   (c) (i) Calculate the helix angle of thread with a lead of 5mm if a screw diameter is 50mm. Take $\pi = 3.142$.
   (ii) Outline six methods that are used to measure threads in the workshop.