THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

789 METAL WORKING AND MECHANICAL PRACTICE

(SUPPLEMENTARY)

Time: 3 Hours. **Year: 2002**

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 'electric arc welding'.

(ii) To which flow of electric energy is arc welding primarily based?

(iii) Explain the function of the coating (flux) on a shielded metal arc welding (SMAW) electrode.

(iv) Define the term 'weldability' of a material.

(b) Explain the importance of maintaining a short arc length in Manual Metal Arc Welding (MMAW).

(c) Outline four specific criteria to be considered during an electrode selection process.

2. (a) Describe the appearance and purpose of the three basic types of oxy-acetylene flame:

(i) Carburizing flame

(ii) Neutral flame

(iii) Oxidizing flame

(iv) Give the two main gases and their functions in Oxy-Fuel Gas Welding (OFW).

(b) Describe the proper procedure for safely shutting down an oxy-acetylene welding set after use.

(c) State four specific hazards associated with the use of acetylene gas in the workshop.

3. (a) Differentiate between brazing and soldering in terms of process temperature and strength of the joint.

(b) (i) Outline four advantages of braze welding over fusion welding.

(ii) Describe the role of 'capillary action' in the brazing process.

(c) In four points, give the importance of borax flux for the braze welding process.

4. (a) Explain the term 'heat-affected zone' (HAZ) and why it is a critical area in a welded joint.

(b) (i) List four types of common welding joints.

(ii) State two advantages of using 'inert gas' in TIG and MIG welding.

(c) Describe the process of 'preheating' a workpiece before welding and list two materials for which it is commonly recommended.

5. (a) (i) Write the hazards of ultraviolet rays produced during arc welding.

(ii) Suggest three ways to prevent exposure to ultraviolet rays.

(b) (i) Differentiate between straight polarity (DCSP) and reverse polarity (DCRP) in DC arc welding.

(ii) Explain the term 'weld puddle'.

(c) State three common causes of 'porosity' (small gas pockets) in a completed weld.

6. (a) List four types of welding defects that can be found in a completed weld.

(b) Describe the importance of 'venting' in resistance welding applications.

(c) State three characteristics of a good filler rod for gas welding.

7. (a) Explain how the classification of brazing alloys is generally done in welding.

(b) State three factors that influence the effectiveness of brazing operations.

(c) Write the chemical name for the flux used in the welding of aluminium and state its purpose.

8. (a) Calculate the total amount of filler metal required (in kg) to complete a butt weld joint on a 10 mm thick plate, given that the required filler metal volume is 45 cm3 and the density of the filler metal is 7.85 g/cm3.

(b) The formula for calculating arc time factor (ATF) is: ATF= $\frac{Arc\ Time}{Total\ Time}\ x\ 100$. Calculate the ATF if the total working time is 8 hours and the actual time the arc is running is 1.5 hours.

(c) Calculate the time (in minutes) required to deposit a 1 m length of weld bead if the travel speed of the electrode is 15 cm/min.