THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2018**

Instructions

1. This paper consists of sections **six (6)** questions.
2. Answer question number **one (1)** and any other **four (4)** questions.
3. Question 1 carries **thirty-two (32)** marks and the rest carries **seventeen (17)** marks each.
4. Non-programmable calculators may be used.
5. Communication devices and any unauthorized materials are **not** allowed in the examination room
6. Write your **Examination Number** on every page of your answer booklet.

1. (a) Define the term "brick bonding" as used in brickwork.

Brick bonding is the arrangement of bricks in a wall in a specific pattern to ensure strength, stability, and uniformity. It involves overlapping bricks so that vertical joints do not align, which enhances the load-bearing capacity and durability of the structure.

(b) Describe with sketches the following types of brick bonds:
(i) English bond
(ii) Flemish bond

In English bond, bricks are laid in alternating courses of headers and stretchers. A header is a brick laid with its short face along the face of the wall, while a stretcher is laid with its long face along the wall. This pattern provides high strength and is commonly used in load-bearing walls.

In Flemish bond, each course contains alternating headers and stretchers. The headers are placed in the middle of the stretchers of the course below, ensuring vertical joints do not align. This bond gives a better appearance but is slightly weaker than the English bond.

(c) Mention four advantages of using proper bonding in brick wall construction.

Proper bonding enhances the strength of the wall by distributing loads evenly. It improves the stability of the structure by preventing cracks due to joint alignment. It ensures aesthetic appearance due to uniform layout of bricks. It also allows better interlocking of bricks, improving resistance to lateral forces.

2. (a) With aid of sketches, differentiate between stretcher bond and header bond.

In stretcher bond, all bricks are laid with their longer face parallel to the wall face. This bond is suitable for half-brick thick walls such as partition walls.

In contrast, header bond uses bricks laid with their shorter face along the wall face. Header bonds are used for thicker walls and provide better transverse strength.

(b) Explain the procedure for setting out a one-brick thick wall.

The procedure begins with marking out the foundation on the ground using pegs and string. A dry bond is then laid to check the arrangement of bricks. Mortar is spread over the foundation, and bricks are laid in alignment with a line and spirit level. The wall is raised in courses, and each course is checked for level and plumb using appropriate tools.

(c) State five safety precautions to be observed when laying bricks on site.

Workers must wear personal protective equipment like gloves and safety boots to prevent injuries. Materials such as bricks and mortar should be stacked properly to avoid collapse. Scaffolding must be inspected for

stability before use. Workers should use tools correctly and avoid overreaching or climbing unstable surfaces. Safe manual handling techniques should be used to avoid strain or injury.

3. (a) Explain the purpose of damp proof course (DPC) in a building structure.

Damp proof course (DPC) is used to prevent moisture from rising through the walls from the ground. This moisture, if unchecked, can damage internal finishes, cause mold growth, and weaken structural components. DPC acts as a barrier between the wall and the ground moisture.

(b) List four types of DPC materials used in masonry.

Bituminous felt is a flexible and waterproof material commonly used in low-cost construction.

Plastic sheeting made of polyethylene is durable and resistant to decay.

Metal sheets such as copper or lead provide a long-lasting solution, especially in permanent structures.

Cement mortar mixed with waterproofing compounds is another option used in specific cases.

(c) With the aid of sketch, describe how a DPC is installed in a solid brick wall.

In a solid brick wall, the DPC is placed horizontally in a mortar bed approximately 150 mm above ground level. A continuous layer of DPC material is laid across the full width of the wall, ensuring no gaps. Bricklaying continues above this layer, maintaining the barrier against moisture.

4. (a) What is an arch as used in brick construction?

An arch is a curved structure constructed to span an opening and support the weight above it. It transfers loads from above to the supports or abutments at either side. Arches are made using wedge-shaped bricks and require centering during construction.

(b) Using labeled sketches, describe the following types of arches:
(i) Semi-circular arch
(ii) Segmental arch

A semi-circular arch forms a perfect half-circle and is commonly used in traditional buildings. It is structurally strong due to its even distribution of loads.

A segmental arch, on the other hand, is a portion of a circle smaller than a semi-circle. It is often used in modern structures where space and height are limited.

(c) State four advantages of using brick arches in wall openings.

Brick arches distribute weight effectively, eliminating the need for heavy lintels. They offer architectural beauty and can be used as decorative elements. They allow for larger openings without compromising strength. They are also durable and resist compressive forces better than flat openings.

5. (a) Describe the steps involved in preparing mortar for bricklaying work.

First, dry components such as cement and sand are measured in the correct ratio and mixed thoroughly. Clean water is gradually added while mixing continues until a uniform consistency is achieved. The mortar is mixed until it is lump-free and workable. It should be used promptly to maintain strength and workability.

(b) Mention four factors affecting the quality of mortar.

The mix ratio of cement to sand affects the strength of the mortar. The cleanliness and grading of sand influence workability and bonding. The amount of water added must be controlled, as too much weakens the mortar. Proper mixing and usage time are essential to prevent setting before application.

(c) Explain the difference between cement-lime-sand mortar and cement-sand mortar in terms of mix ratio and application.

Cement-lime-sand mortar is made in the ratio of 1:1:6 and offers better workability and flexibility. It is suitable for plastering and internal wall finishes. Cement-sand mortar, with a ratio like 1:4, is stronger and used for structural walls. Lime in the former mix enhances plasticity, while the latter provides higher strength.

6. (a) (i) What is pointing in brickwork?

Pointing is the process of finishing the mortar joints in brickwork after the bricks are laid. It involves removing a portion of old or loose mortar and refilling it neatly to protect the wall and improve appearance. It is often done during maintenance or to enhance the wall's weather resistance.

(ii) Mention and describe four types of pointing used in masonry.

Flush pointing is when mortar is pressed and finished flush with the brick surface. Recessed pointing involves pushing mortar back into the joint to create a groove. Weathered pointing is sloped to allow water runoff, with the top recessed more than the bottom. Keyed pointing includes forming a groove or decorative mark for visual appeal and better adhesion.

(b) Distinguish between pointing and jointing.

Pointing is done after the wall is built to improve durability and appearance, while jointing is done during bricklaying as part of the construction process. Pointing requires raking out and refilling joints, while jointing involves shaping the joints when the mortar is still fresh. Pointing is used for renovation and weatherproofing, while jointing is part of the initial wall finish.

(c) State three advantages of proper joint finishing in a wall.

Proper joint finishing prevents water from entering the wall and causing damage. It improves the appearance of the structure, giving it a clean and uniform look. It also enhances the durability of the wall by protecting the joints from erosion and wear over time.