THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2004**

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 "setting out" in masonry construction.

Setting out is the process of transferring the building design from drawings to the ground. It involves marking the positions of walls, foundations, and openings using pegs, string lines, and other tools to ensure accurate alignment and positioning of the structure.

(b) State three important tools used during setting out and describe their functions.

The builder's square is used to ensure corners are set at accurate right angles, especially in room layouts and foundation corners.

The measuring tape is essential for taking accurate distances between points, ensuring the structure aligns with the dimensions in the design.

String lines are stretched between pegs or nails to guide straight walls, foundations, and alignments during excavation and bricklaying.

(c) Explain how errors during setting out can affect the final structure.

Errors during setting out can lead to misalignment of walls, causing rooms to be uneven or not square. This affects wall bonding and finish quality. It may also result in structural instability if load-bearing elements are misplaced, and can cause costly demolition and rework.

2. A boundary wall in an open field collapsed six months after construction.
(i) Identify four likely causes of the failure.

One likely cause is shallow or weak foundation, which could not support the weight of the wall or resist soil movement during rain or wind.

Poor mortar mix or ungraded blocks could lead to weak joints, reducing the wall's ability to carry load or withstand lateral pressure.

Lack of control or expansion joints may have caused cracks due to thermal expansion, leading to gradual weakening.

Exposure to strong wind without reinforcement or piers would result in overturning of the wall due to lack of lateral stability.

(ii) Explain corrective measures that should have been applied during construction to avoid the collapse.

A deeper, properly compacted foundation with adequate width should have been constructed, particularly in open areas with loose soil.

Using quality-controlled mortar (e.g., 1:4 cement-sand mix) and high-strength, well-cured blocks would ensure a durable bond.

Inclusion of vertical and horizontal reinforcement bars and piers at intervals would provide support against wind and movement.

Control joints should be placed at regular intervals to absorb expansion and prevent random cracking.

(iii) Propose design modifications to improve wall stability in similar future projects.

Increase the wall thickness or add reinforced concrete columns (piers) at 3–4 meter intervals to improve resistance to bending and overturning.

Incorporate a reinforced coping at the top to bind the wall and prevent moisture ingress.

Construct a reinforced concrete footing with a wide base to spread the load and increase foundation stability.

3. (a) What is meant by the term "coping" in brickwork?

Coping is the protective covering placed on the top of walls, particularly parapet and boundary walls, to prevent water penetration. It also finishes the wall aesthetically.

(b) State three types of coping commonly used on walls.

Flat coping is a simple horizontal layer made of concrete or stone, often used where aesthetics are not a priority.

Sloped or weathered coping is angled to drain off rainwater, preventing standing water on top of the wall.

Coping with drips includes an overhanging edge that allows water to fall away from the wall face, protecting it from staining and erosion.

(c) Explain the importance of providing proper coping on boundary and parapet walls.

Coping prevents rainwater from seeping into the top course of bricks, which can cause mortar weakening and cracks due to freeze-thaw cycles. It also reduces staining on wall surfaces and prolongs the structural life of exposed walls by protecting them from erosion.

4. You are tasked with estimating the number of blocks required to build a 3 m high wall, 20 m long, using standard hollow blocks of size 400 mm x 200 mm x 200 mm.
(i) Calculate the total number of blocks required, allowing 5% for breakage.

Wall area = 3 m × 20 m = 60 m²
Block face area = 0.4 m × 0.2 m = 0.08 m²
Blocks needed without wastage = 60 ÷ 0.08 = 750
Including 5% breakage: 750 × 1.05 = 787.5 ≈ **788 blocks**

(ii) Suggest two additional materials needed for this wall and their purposes.

Mortar (cement and sand) is essential for bonding the blocks together, filling joints, and providing structural strength.

Reinforcement bars may be used for vertical and horizontal reinforcement to resist wind pressure and increase wall stability.

(iii) Describe briefly the steps involved in building this wall from foundation to completion.

Start by excavating a trench for the foundation and pour a reinforced concrete footing. Lay the first course of blocks on the cured footing, ensuring alignment with string lines and plumb bobs.

Continue block laying course by course, checking level and verticality regularly. Provide weep holes if necessary for drainage.

Install coping or capping at the top of the wall, then cure the entire structure for 7–14 days with light water spraying.

5. (a) Differentiate between stretcher bond and header bond in terms of arrangement and application.

Stretcher bond involves laying bricks with their long face visible, used mainly for walls of half-brick thickness where load is low. Header bond uses the short end of bricks facing outward, suitable for thick walls where high load strength is needed.

(b) Which of the two bonds is more suitable for half-brick partition walls and why?

Stretcher bond is more suitable for half-brick partition walls because it uses fewer bricks, is easier to lay, and provides enough strength for non-load-bearing partitions.

(c) Illustrate with a simple sketch how a corner is bonded using stretcher bond.

In a stretcher bond corner, alternate courses overlap at 90 degrees. On the first course, one wall extends with full bricks, and the adjoining wall starts with a half-brick to maintain overlap. The pattern alternates in the next course.

6. (a) What is a pier in masonry?

A pier is a vertical projection or thickened portion of a wall that acts like a pillar, used to provide lateral support and increase the wall's ability to carry vertical and horizontal loads.

(b) Mention two reasons for providing piers in long walls.

Piers reduce the unsupported span of a long wall, preventing buckling or collapse due to wind or lateral pressure. They also help distribute concentrated loads, such as from beams or slabs, evenly into the foundation.

(c) Explain how piers contribute to the strength and stability of a structure.

Piers increase the effective thickness at intervals along the wall, resisting out-of-plane forces and providing stiffness. They also help absorb seismic or vibrational loads, minimizing damage during external stress events.