THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2001**

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 "block bond" as used in masonry construction.

Block bond refers to the method or pattern by which concrete or cement blocks are laid in a wall to achieve structural stability and aesthetic appearance. Proper bonding ensures that vertical joints are staggered, which enhances the load distribution and prevents cracking.

(b) Mention three types of bonds used in block or brickwork and state where each is best applied.

Stretcher bond is the most common pattern where blocks are laid lengthwise. It is widely used in half-brick thick partition walls and boundary walls for simplicity and speed.

English bond alternates courses of headers and stretchers. It is stronger and ideal for load-bearing walls that require good strength and durability.

Flemish bond combines headers and stretchers in each course, giving an attractive finish. It is best used where appearance is important, such as in decorative external walls.

(c) Explain the importance of alternating bonding patterns in long walls.

Alternating bonding patterns help prevent the alignment of vertical joints in successive courses, which improves wall strength and resists shear forces. It also helps distribute the weight of the wall more evenly, reducing the chances of cracks and structural failure.

2. You are given the task to build a boundary wall that is 30 meters long and 2.4 meters high using blocks of 400 mm × 200 mm × 200 mm:
(i) Calculate the total number of blocks required (allow 5% for wastage).

Wall area = 30 × 2.4 = 72 m²
Block face area = 0.4 × 0.2 = 0.08 m²
Blocks needed = 72 ÷ 0.08 = 900
Wastage allowance = 900 × 1.05 = **945 blocks**

(ii) If each block requires 0.0035 m³ of mortar, calculate the total volume of mortar required.

Mortar volume = 945 × 0.0035 = **3.3075 m³ ≈ 3.31 m³**

(iii) Suggest how mortar mix can affect the quality of this boundary wall.

The strength and durability of the mortar directly affect the wall's resistance to weather and structural loads. A weak or improperly mixed mortar can lead to joint cracking, water infiltration, and eventual collapse. A proper mix ensures bond integrity, resistance to moisture, and long-term performance of the wall.

3. (a) Explain the function of a lintel in masonry openings.

A lintel is a horizontal structural element placed above openings like doors and windows to support the wall weight above. It transfers the load around the opening to adjacent walls, preventing cracks or collapse above the opening.

(b) List three materials commonly used for constructing lintels.

Reinforced concrete lintels are the most common due to their strength and ability to span large openings.

Steel angle lintels are used in situations requiring quick installation or where a slim profile is needed.

Precast concrete lintels are manufactured off-site and used for speed and uniform quality.

(c) Describe how lintel placement is coordinated with wall construction.

Lintels must be placed at the exact height of the door or window opening, with a bearing length of at least 150 mm on both ends. The wall is built up to the lintel level, the lintel is set in place, and then masonry continues above it. The timing must ensure proper curing and alignment.

4. During a site inspection, you notice white crystalline deposits on the wall surface:
(i) Identify the phenomenon and its cause.

This is known as efflorescence. It is caused by water-soluble salts in bricks, mortar, or groundwater migrating to the surface and crystallizing as the water evaporates.

(ii) Describe two methods for preventing it during construction.

Use low-salt-content materials like properly cured bricks and clean sand to reduce the salt source.

Ensure good drainage and damp-proofing to prevent water ingress into the wall, especially from the base or top of walls.

(iii) Suggest one treatment method for already affected surfaces.

Dry brushing followed by rinsing with clean water can remove light efflorescence. For more persistent cases, a mild acid solution (like diluted vinegar or hydrochloric acid) can be applied, followed by thorough rinsing to prevent residue.

5. (a) What is the purpose of a pier in long masonry walls?

Piers provide lateral support to long walls, increasing their resistance to buckling and wind pressure. They also help distribute load more evenly and reduce the unsupported length of the wall, enhancing stability.

(b) Differentiate between engaged piers and detached piers.

Engaged piers are built as part of the wall thickness, projecting from the wall but connected structurally.

Detached piers are separate columns built close to the wall and connected by beams or ties to offer additional support.

(c) State two effects of omitting piers in boundary wall construction.

Omitting piers in long walls can lead to bowing or collapse due to wind pressure, especially in exposed areas. It also reduces the structural integrity of the wall, making it more susceptible to cracking or overturning.

6. A classroom wall is to be plastered on both sides. The wall measures 9 m long, 3.5 m high, and is 200 mm thick:
(i) Calculate the total plastering area.

Plastering both sides:
Area = 2 × (9 × 3.5) = 2 × 31.5 = **63 m²**

(ii) If plaster thickness is 12 mm, find the plaster volume in cubic meters.

Thickness = 12 mm = 0.012 m
Volume = 63 × 0.012 = **0.756 m³**

(iii) Estimate the number of cement bags required if 1 m³ of plaster needs 6 bags.

Bags = 0.756 × 6 = **4.536 ≈ 5 bags**