THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION.

784 **BRICKWORK AND MASONRY**

(SUPPLEMENTARY)

Time : 3 Hours **ANSWERS** **Year : 2013**

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

1. (a) What is a "retaining wall"?

A retaining wall is a structure designed to resist the lateral pressure of soil, water, or other materials, preventing the earth from sliding or eroding. It maintains different ground levels on either side of the wall.

(b) Outline four advantages of using concrete blocks for retaining walls.

Concrete blocks are durable and resist weathering. They are uniform in size, facilitating quicker construction. They provide good compressive strength for holding soil loads. They can be reinforced easily to increase stability against lateral pressures.

(c) Detail the on-site production process for hollow concrete blocks used in such walls.

Mix cement, sand, and coarse aggregate with water to obtain a workable concrete mix. Pour the mix into hollow block molds and compact it thoroughly. Cure the blocks for a minimum period, typically 7–14 days, by keeping them moist. After curing, remove the blocks from molds and stack them for use in construction.

2. (a) Define "voussoir" in the context of arches.

A voussoir is a wedge-shaped stone or brick used to construct an arch. Each voussoir is precisely shaped to transfer loads efficiently from the arch to its supports.

(b) Name four key components of an arch structure.

The four components are the springer (base stone supporting the arch), the keystone (central top stone locking the arch), the voussoirs (wedge-shaped elements forming the arch), and the abutments (supporting walls or structures on each side).

(c) Using simple diagrams, compare a jack arch and a corbelled arch.

A jack arch is nearly flat and composed of wedge-shaped bricks or stones spanning an opening, transferring loads to the sides. A corbelled arch is formed by projecting successive courses of masonry

gradually inward until they meet at the top. The jack arch relies on true arch action, whereas the corbelled arch acts more like a cantilever.

3. (a) What is meant by "bonding" in masonry?

Bonding in masonry refers to the pattern in which bricks or stones are laid to ensure strength, stability, and load distribution. Proper bonding also affects the aesthetic appearance of the wall.

(b) Provide three purposes of bonding in wall construction.

Bonding improves the structural integrity of the wall. It ensures even load transfer between courses. It reduces vertical joints lining up, preventing cracks and weaknesses in the wall.

(c) Illustrate the procedure for bonding a new pier to an adjacent masonry wall.

The existing wall end is raked back or stepped to expose fresh mortar keying points. Mortar is applied to the joint, and the new pier is built carefully to align with the existing wall courses. Proper interlocking or use of reinforcement ensures continuous load transfer and wall stability.

4. (a) List four common issues in newly built masonry structures.

Cracks due to settlement, efflorescence, bulging walls, and shrinkage cracks.

(b) Discuss the reasons behind each issue from part (a).

Settlement cracks occur when the foundation adjusts to soil loads. Efflorescence happens when soluble salts migrate to the wall surface with moisture. Bulging walls result from lateral pressures exceeding the wall's capacity. Shrinkage cracks arise from drying and contraction of mortar or masonry units.

(c) Propose one remedial action for each issue.

Settlement cracks can be repaired using grout injection or controlled stitching. Efflorescence is removed with dry brushing and prevented by proper DPC installation. Bulging walls may require underpinning, wall anchors, or partial reconstruction. Shrinkage cracks can be filled with suitable flexible sealants or mortar repairs.

5. (a) Explain "expansion joint" in masonry terms.

An expansion joint is a planned gap in a masonry wall to accommodate movements caused by thermal expansion, moisture changes, or settlement, preventing uncontrolled cracking.

(b) Mention three reasons for including expansion joints.

To relieve thermal stresses. To allow for moisture-induced expansion or contraction. To prevent cracks from settlement or structural movements.

(c) With a basic sketch, indicate the placement and detailing of a horizontal expansion joint in a wall.

A horizontal expansion joint is placed at a regular vertical interval, often between courses of masonry. It is filled with compressible material and sometimes sealed with flexible sealant to allow controlled movement while maintaining water resistance.

6. (a) (i) What does "pointing" mean in wall finishing?

Pointing is the finishing of exposed mortar joints in brickwork to provide weather protection, improve appearance, and fill voids left during laying.

(ii) Describe three common pointing styles.

Flush pointing – mortar is finished level with the brick face. Recessed pointing – mortar is slightly set back from the brick surface, creating shadow lines. Weathered pointing – mortar slopes outward to shed rainwater efficiently.

(b) Outline four safety steps for applying plaster to internal walls.

Ensure scaffolding is stable and properly erected. Wear protective gear such as gloves and masks. Keep tools clean and in good condition. Avoid overreaching or standing on unstable platforms.

(c) State three consequences of ignoring these steps during plastering.

Injury to workers due to falls or equipment misuse. Poor plaster quality with uneven or cracked surfaces. Increased risk of respiratory issues or skin irritation due to exposure to dust and chemicals.