THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2012**

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 “precast concrete block”.

A precast concrete block is a masonry unit that is manufactured by casting concrete into molds and allowing it to harden before being used in construction. Unlike in-situ concrete, which is cast on the building site, precast blocks are prepared ahead of time either on site or in a factory.

These blocks are typically made from a mix of cement, sand, gravel, and water, and can be shaped into solid or hollow units depending on their intended use.

(b) State four advantages of using precast concrete blocks in walling.

Precast blocks allow faster construction since they are ready to use and do not require time to set on site like cast-in-place concrete.

They are more uniform in size and shape, which ensures neater work and less finishing.

Using precast blocks reduces the amount of formwork and labor needed, which helps lower the overall construction cost.

They can be made on-site using simple equipment, making them ideal for low-cost housing and remote areas.

(c) Describe the process of manufacturing solid precast concrete blocks at the site.

First, the materials (cement, sand, aggregate, and water) are measured and mixed thoroughly to form a consistent concrete mixture.

The wet concrete is then poured into steel or wooden molds shaped to the desired block size.

The molds are vibrated or compacted to remove air pockets and ensure density. The blocks are left in the molds for initial setting, usually a few hours.

Once partially set, the blocks are carefully removed and placed in a shaded area to cure. Water is applied regularly for 7 to 14 days to allow proper strength development.

2. (a) What is a brick arch?

A brick arch is a curved structure made from bricks arranged in a specific pattern over an opening such as a doorway or window. It supports the weight of the wall above by transferring the load to the abutments on either side of the opening.

Brick arches are built using wedge-shaped bricks known as voussoirs and require centering during construction to hold the bricks in place until the arch is completed.

(b) Mention four parts of a brick arch.

The keystone is the central topmost brick in the arch that locks all other bricks into position.

The voussoirs are the wedge-shaped bricks forming the curved sides of the arch.

The springing line is the imaginary horizontal line from where the curve of the arch begins.

The abutments are the supports on either side of the arch that receive the load and transfer it to the foundation.

(c) With the aid of sketches, differentiate between a flat arch and a semi-circular arch.

A flat arch is nearly horizontal, with the bricks laid in a slight curve or straight line. It is suitable for small spans and often used for decorative purposes in door and window openings.

A semi-circular arch forms a perfect half-circle and provides better load distribution and strength. It is more suitable for structural applications, particularly in traditional and classical architecture.

The main visual difference lies in the curvature: flat arches are almost straight, while semi-circular arches have a pronounced curved shape.

3. (a) Define the term “masonry pier”.

A masonry pier is a vertical column made of bricks, blocks, or stone that is built to support a structural load or to strengthen and stabilize a wall. Piers can be freestanding or attached to walls.

They serve both structural and architectural functions and are used in boundary walls, retaining walls, and buildings to carry loads or resist lateral pressure.

(b) Give three reasons for constructing masonry piers in wall structures.

Masonry piers increase the load-bearing capacity of walls by providing concentrated support at intervals.

They help prevent long walls from buckling or bowing by offering lateral reinforcement.

They act as supports for arches, beams, or lintels and also provide anchorage for gates or fencing.

(c) Describe the correct procedure for building a masonry pier to bond with an existing wall.

First, the area where the pier will connect to the wall is cleaned and prepared by removing any loose material or existing plaster.

Bricks or blocks are laid in a stretcher-header pattern, with alternate courses overlapping the existing wall to create a good bond.

Mortar is applied evenly, and each course is checked for plumb and level using a spirit level.

Reinforcement may be added vertically if the pier is structural, and the pier should be tied into the existing wall for maximum stability.

4. (a) State four defects that may occur in freshly constructed walls.

Cracking can appear in the mortar or bricks due to shrinkage, settlement, or temperature changes.

Efflorescence is the white powdery deposit on the surface caused by soluble salts migrating through the masonry.

Bulging occurs when a wall becomes curved or deformed, often due to improper bonding or load distribution.

Mortar dropping from joints leaves hollow spaces or weak points within the wall.

(b) Explain the causes of each defect mentioned in 4(a).

Cracking may be caused by rapid drying of mortar, poor mixing, or movement in the foundation.

Efflorescence is usually due to water dissolving salts in the bricks or mortar, which then crystallize on the surface as moisture evaporates.

Bulging results from excessive load, lack of proper bonding, or moisture expansion of materials.

Mortar dropping happens when joints are not properly filled or compacted, often due to hurried or careless workmanship.

(c) Suggest one preventive measure for each defect.

To prevent cracking, ensure proper curing of walls and control the water-cement ratio.

Efflorescence can be reduced by using clean, low-salt materials and preventing water penetration.

Bulging can be avoided by using proper bonding patterns and ensuring load is distributed evenly.

Mortar dropping can be prevented by applying mortar carefully and compacting it fully into all joints.

5. (a) Explain the term “construction joint” as used in masonry.

A construction joint is a planned break or separation in masonry work where construction has stopped temporarily, usually at the end of the day or due to other constraints.

It allows work to be resumed later without weakening the structure and ensures that bonding and continuity are maintained across the joint.

(b) State three purposes of providing construction joints.

Construction joints ensure continuity of the structure when work is carried out in stages.

They help control shrinkage and accommodate slight movements in the wall without causing cracks.

They provide a convenient and controlled location for restarting masonry work while maintaining proper alignment and strength.

(c) With the help of a sketch, show the correct position and arrangement of a vertical construction joint in a long wall.

The vertical joint is placed at the end of the day’s work or where there is a change in construction phase. It is made straight and aligned vertically.

Before resuming work, the joint face is cleaned and wetted. Mortar is applied freshly to ensure proper bonding between new and old work.

Metal ties or reinforcement may be used across the joint to improve structural continuity and prevent separation.

6. (a) (i) What is wall rendering?

Wall rendering is the application of a thin coat of mortar, usually made of cement and sand, to the surface of a masonry wall to provide a smooth or textured finish.

Rendering is used to protect walls from weather, improve appearance, and prepare surfaces for painting or decoration.

(ii) State three types of finishes that can be applied to rendered surfaces.

Smooth finish is achieved by troweling the render to a fine, even texture suitable for painting.

Textured finish is created by using brushes, sponges, or specialized tools to form patterns or designs on the surface.

Roughcast finish involves throwing or spraying a coarse mix onto the wall to create a rough and durable surface.

(b) Describe four precautions to take when rendering external walls.

The wall surface must be clean and free from dust, oil, or loose particles to ensure good bonding of the render.

The wall should be dampened before applying render to reduce suction and prevent premature drying.

Rendering should be done in cool or shaded conditions to avoid rapid evaporation, which can cause cracking.

Control joints or beads should be provided to manage shrinkage and movement, especially on large surfaces.

(c) Explain three reasons why rendering may fail if precautions are not followed.

If the surface is not clean, the render may not adhere properly and could peel off over time.

If the wall is too dry, it may absorb water from the render too quickly, leading to cracking and weak bonding.

Exposure to direct sun or wind during rendering can cause rapid drying, which leads to surface shrinkage, cracks, and poor strength.