THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2010**

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 “fireplace” in masonry construction.

A fireplace is a structure built into a wall, usually at floor level, that provides a space for an open fire used for heating or cooking. In masonry construction, it is typically made of bricks, stones, or concrete and includes a firebox, flue, and chimney to ensure safe and efficient combustion.

It is commonly located on external walls to facilitate the venting of smoke and gases through the chimney.

(b) State four components of a typical brick fireplace.

The firebox is the main chamber where the fire is lit. It must be made of fire-resistant materials such as refractory bricks.

The hearth is the floor area in front of and beneath the firebox that protects the building’s flooring and provides a safe space around the fire.

The chimney is a vertical shaft that vents smoke and gases from the fireplace to the outside atmosphere.

The flue is the internal passage within the chimney that directs the flow of gases upward and prevents backflow into the room.

(c) Describe how a brick fireplace is constructed in an external wall of a house.

Construction begins by laying a fire-resistant foundation below the floor level, usually using reinforced concrete.

The firebox is built using firebricks and heat-resistant mortar, with care to maintain proper size and shape for combustion.

The hearth is formed at the base of the firebox, extending outward to protect the floor. Bricks are laid flat and flush with the floor.

The chimney is constructed vertically above the firebox using solid bricks, with a flue inside for smoke passage. The joints must be sealed, and the flue may include a damper to regulate airflow.

Flashings are installed at the wall intersection to prevent water leakage where the chimney passes through the roof.

2. (a) What is a retaining wall?

A retaining wall is a structure designed to hold back or support soil at different levels on either side. It prevents the natural movement of soil, especially in sloped terrain or excavated areas.

Retaining walls resist the lateral pressure of soil and help stabilize landscapes or protect structures from erosion and collapse.

(b) Mention three types of retaining walls used in construction.

Gravity retaining walls rely on their own weight and mass to resist soil pressure. They are commonly made of concrete or stone.

Cantilever retaining walls use reinforced concrete and an L- or T-shaped design to resist pressure through leverage.

Counterfort retaining walls are similar to cantilever types but include internal triangular braces or "counterforts" to strengthen the wall and reduce bending stress.

(c) With the aid of a sketch, describe how a gravity retaining wall resists soil pressure.

A gravity retaining wall has a wide base and tapers toward the top. Its weight and thickness counteract the horizontal force of the soil pushing against it.

The wall is built with a slight backward batter (lean) and often includes a drainage layer or weep holes to relieve hydrostatic pressure.

The base is embedded slightly into the ground for anchorage, and the wall material must be dense enough to resist overturning and sliding.

3. (a) Define the term "threshold" as used in door construction.

A threshold is the strip or plate located at the base of a door opening, forming a transition between two floor levels or spaces. It provides a finished edge and can help prevent water or air infiltration.

Thresholds can be constructed using wood, stone, concrete, or metal depending on the type of building and floor finish.

(b) State three functions of a door threshold.

It seals the bottom of the door to prevent drafts, water ingress, or pests from entering the room.

It provides a smooth transition between different floor surfaces or elevations on either side of the door.

It reinforces the lower part of the doorway and reduces wear and tear due to foot traffic or movement of items across the floor.

(c) Explain how a concrete threshold is constructed and finished during floor work.

First, the space between the door frames at floor level is cleaned and prepared with formwork or edge guides.

Concrete is poured into the space to a thickness matching the adjacent floor finishes. Reinforcement may be added for durability.

Once leveled, the concrete is trowelled to a smooth finish and allowed to cure. It may be sloped slightly to direct water away from interior spaces.

After curing, surface finishes such as polishing or the addition of non-slip textures can be applied if required.

4. (a) Mention four factors to consider when choosing materials for masonry walls.

The strength of the material is important to ensure it can carry the intended load without failure.

Durability is essential so the material can withstand weather, wear, and other environmental factors over time.

Cost must be considered in relation to the overall project budget, including transportation and labor.

Aesthetic value affects the visual appearance and should match the architectural style or design intent of the building.

(b) Describe how poor selection of materials can affect the strength and durability of walls.

Using weak materials can result in walls that cannot bear structural loads, leading to cracking or collapse.

Low-quality bricks or blocks may absorb water, swell, and deteriorate over time, causing dampness and weakening the wall.

Incompatible materials may not bond well with mortar or finishes, resulting in separation, cracking, or failure of wall elements.

(b) Suggest three ways to ensure quality control when sourcing masonry materials.

Purchase materials from certified suppliers who meet industry or national standards.

Inspect and test samples on site before full delivery to ensure consistency in size, shape, and strength.

Store materials properly on site to prevent contamination, moisture absorption, or damage before use.

5. (a) What is a reveal in wall construction?

A reveal is the vertical side surface of a wall opening such as a window or door, typically extending from the external face to the frame.

It is formed by the thickness of the wall and can be left exposed, plastered, or finished for both decorative and functional purposes.

(b) Explain three purposes of providing reveals in windows and door openings.

Reveals help protect window and door frames by allowing for a recessed fit, which shields them from direct exposure to weather.

They provide a neat finish and contribute to the aesthetic appearance of the building, especially when uniformly aligned.

Reveals create space for installation of hardware like hinges, locks, and sills, making installation more accurate and secure.

(c) With the aid of a sketch, describe how a reveal is formed in a wall.

During construction, bricks or blocks are laid to maintain a stepped or offset arrangement at the edges of the opening.

The reveal width is predetermined, and bricks are adjusted or cut to fit neatly around the frame line.

A vertical surface is formed along the sides of the opening, which is then finished with mortar or plaster for a clean edge.

6. (a) (i) Define the term “load transfer” in relation to masonry walls.

Load transfer refers to the process by which forces acting on a structure such as roof loads, floor loads, or external pressures are safely passed through the walls down to the foundation.

Proper load transfer ensures that stresses are evenly distributed and the building remains stable under various loading conditions.

(ii) State three mechanisms by which masonry walls transfer load.

Gravity loads from above are transmitted vertically through the wall to the foundation due to the compressive strength of the materials.

Horizontal forces, such as wind pressure, are resisted and transferred laterally through wall stiffness and anchorage to floors and roofs.

Concentrated loads from beams or slabs are spread across the wall's width through bearing surfaces or pads before moving downward.

(b) Explain three consequences of poor load transfer in wall construction.

Uneven or failed load transfer causes cracking in walls, especially near openings, corners, or junctions.

Walls may bulge or tilt if loads are not properly balanced, leading to instability and risk of collapse.

The foundation may be overstressed in localized areas, causing differential settlement or structural distortion.

(c) Suggest three measures to improve load transfer in multi-storey masonry buildings.

Use reinforced masonry techniques such as vertical and horizontal reinforcement bars to increase the wall's load-carrying capacity.

Ensure proper alignment of load paths by placing walls directly above one another across floors to minimize eccentric loading.

Install lintels, bond beams, and stiffeners where needed to help distribute loads around openings and transitions.