THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2016**

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 “formwork”.

Formwork is a temporary structure or mold used to support wet concrete until it hardens and can support itself. It defines the shape, size, and surface texture of the finished concrete element.

Formwork is essential in shaping components such as columns, beams, slabs, and walls during construction. It can be made from timber, steel, plywood, or plastic.

(b) State four qualities of good formwork.

Good formwork should be strong enough to support the weight of wet concrete and any additional loads without deflecting or collapsing.

It should be watertight to prevent the leakage of cement slurry, which can weaken the concrete.

The formwork should be easy to assemble, remove, and reuse, which saves time and cost in construction.

It should not react chemically with concrete or leave stains, ensuring a smooth and clean surface finish.

(c) Describe the procedure for constructing and removing formwork for a concrete column.

First, the exact dimensions of the column are measured and marked on the foundation. Timber or steel panels are cut and assembled to form a rectangular or circular mold.

The formwork is braced and aligned vertically using a spirit level and plumb line. Tie rods or clamps are used to hold the panels together tightly.

Concrete is then poured into the mold and compacted using vibrators to remove air pockets. The formwork is left in place until the concrete has set and gained sufficient strength.

To remove the formwork, bolts and clamps are carefully released. The panels are taken off gently to avoid damaging the column. The removed formwork can be cleaned and reused.

2. (a) What is meant by scaffolding in construction?

Scaffolding is a temporary framework erected on a construction site to provide workers with access to elevated areas of a building.

It serves as a platform for placing tools, materials, and workers during bricklaying, plastering, or painting activities. It also enhances safety and mobility at heights.

(b) Explain the functions of scaffolding during masonry works.

Scaffolding provides a safe working platform for masons to reach higher parts of walls and other structures under construction.

It allows for the efficient movement of tools, bricks, and mortar between ground and work levels, speeding up construction work.

Scaffolding supports workers' balance and reduces fatigue by offering stable footing and organized workspaces.

It ensures the quality of work by enabling workers to work at a comfortable height, which improves precision and consistency.

(c) With the aid of a sketch, describe a simple working scaffold and label four important parts.

A simple working scaffold consists of vertical standards (upright supports), horizontal ledgers (longitudinal horizontal members), putlogs (horizontal supports for planks), and platforms (working surfaces).

The standards are embedded in the ground or placed on base plates. Ledgers are fixed to the standards using couplers. Putlogs are inserted into wall gaps or supported by ledgers.

On top of putlogs, planks are placed to create the platform where masons stand. Toe boards and guard rails are added for safety.

3. (a) State four defects commonly found in brickwork after construction.

Cracks in walls are common defects and can appear either vertically or horizontally. They may result from foundation settlement or thermal movement.

Efflorescence is the white, powdery deposit on brick surfaces caused by soluble salts in mortar or bricks reacting with moisture.

Spalling refers to the breaking or flaking of brick surfaces, often due to freeze-thaw action or use of low-quality bricks.

Uneven joints or misaligned courses are also defects that occur when bricks are not laid in proper alignment, leading to poor appearance and weak walls.

(b) Give two causes for each defect mentioned in 3(a).

Cracks may be caused by unequal settlement of the foundation or shrinkage of mortar during drying.

Efflorescence may result from using salty water in mortar or bricks that contain soluble salts.

Spalling can be due to moisture entering the brick and freezing, or the use of over-burnt or under-burnt bricks.

Uneven joints may be caused by lack of proper supervision during bricklaying or failure to use leveling tools.

(c) Describe the remedial measures for correcting two of the defects.

To correct cracks, the affected area should be cut open and filled with appropriate sealant or repair mortar. If cracks are structural, reinforcement or underpinning may be required.

Efflorescence can be removed by brushing the surface with a dry stiff brush and applying a sealing coat to prevent further moisture entry.

4. (a) Explain the difference between lime mortar and cement mortar.

Lime mortar is made by mixing lime, sand, and water. It sets slowly and remains more flexible, making it suitable for old or heritage buildings.

Cement mortar is made by mixing cement, sand, and water. It sets quickly and has higher compressive strength, making it more suitable for modern construction and load-bearing walls.

(b) Give three advantages and three disadvantages of using lime mortar in masonry construction.

One advantage of lime mortar is its flexibility, which allows it to absorb movement and prevent cracking.

It is breathable, allowing moisture to escape from walls, reducing dampness.

It is more environmentally friendly since lime production emits less carbon dioxide than cement.

However, lime mortar has lower strength compared to cement mortar, making it unsuitable for heavy loads.

It takes longer to set, which may delay construction progress.

It is more sensitive to water and frost during early stages, requiring careful curing.

(c) State the precautions to be taken when storing cement on site.

Cement should be stored in a dry, enclosed space protected from rain, moisture, and humidity.

It should be placed on wooden pallets or raised platforms to prevent contact with the ground.

Bags should be stacked in a stable manner with limited height, and used on a first-in-first-out basis to avoid aging.

The storage area should be well-ventilated, and bags should not be stacked against external walls where dampness may penetrate.

5. (a) What is the importance of using a plumb line and spirit level in masonry work?

A plumb line ensures that vertical surfaces such as walls or columns are truly upright, which is essential for structural stability and appearance.

A spirit level ensures that horizontal surfaces such as window sills or wall courses are level, preventing water pooling and ensuring neatness.

Using these tools helps maintain precision and alignment in construction, reducing errors and wastage.

They improve the overall quality and safety of the structure by ensuring proper load distribution and wall balance.

(b) Mention four possible effects of laying bricks without checking verticality and horizontality.

Walls may become unstable and prone to collapse due to uneven load distribution.

Doors and windows may not fit properly, leading to operational issues and poor appearance.

The wall may lean or bulge, creating an unsafe condition that may require demolition or major repair.

The aesthetic finish of the wall is compromised, reducing the quality and value of the building.

(c) Describe the correct procedure for using a plumb line to check a wall.

One end of the plumb line is tied to a fixed point above, such as a scaffolding or pole aligned with the wall face.

The weighted end is allowed to hang freely, creating a straight vertical line by gravity.

The position of the plumb line is compared to the wall surface at various points from top to bottom.

If the wall surface deviates from the plumb line, adjustments are made by realigning the bricks or filling the gaps with mortar.

This process is repeated regularly during construction to maintain vertical alignment.

6. (a) (i) Define the term “rendering”.

Rendering is the process of applying a layer of cement or lime-based plaster to the external or internal surface of masonry walls.

It provides a smooth, protective, and decorative finish to brick or block walls and helps cover irregularities.

(ii) State three purposes of rendering in masonry.

Rendering improves the appearance of walls by giving them a uniform and clean surface.

It protects the wall from weather elements such as rain, sunlight, and wind, which could damage the bricks or mortar.

Rendering can also provide thermal and acoustic insulation, making buildings more energy-efficient and comfortable.

(b) Describe the correct procedure for preparing a wall surface for rendering.

The wall surface should be cleaned to remove dust, oil, loose mortar, or any other contaminants.

Uneven areas should be trimmed, and cracks should be filled. The wall may be lightly dampened with water to prevent absorption of moisture from the render.

A bonding agent may be applied if needed, and rendering guides or screeds are installed to help apply the plaster evenly.

Rendering is then applied in layers using a trowel and leveled with a straight edge for a uniform finish.

(c) Explain three problems that may occur during rendering and how to prevent them.

Cracking may occur due to shrinkage or poor bonding. This can be prevented by using well-mixed mortar and applying it in layers not too thick.

Blistering occurs when trapped air expands during drying. It can be avoided by applying the render carefully and compacting it well.

Hollow patches may form if the render does not bond properly with the wall. This can be prevented by ensuring the wall surface is properly prepared and dampened before application.