THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

784 **BRICKWORK AND MASONRY**

Time: 3 Hour. **ANSWERS** **Year: 2017**

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 "cavity wall".

A cavity wall is a type of wall construction made up of two separate walls or leaves, usually of brick or block, with a continuous air space or cavity between them. The two leaves are tied together with wall ties at regular intervals.

The outer leaf serves as the external protection against weather, while the inner leaf provides strength and insulation. The cavity between the two leaves acts as a barrier to moisture and improves thermal performance.

(b) State four advantages of using cavity walls in building construction.

Cavity walls provide excellent thermal insulation. The air space between the two walls reduces heat transfer, keeping the interior cooler in hot weather and warmer in cold weather.

They improve moisture resistance. The cavity prevents rainwater from penetrating through to the inner leaf, which helps in preventing dampness inside buildings.

They reduce sound transmission. The gap between the walls helps to dampen external noise, improving acoustic comfort within the structure.

They offer better structural stability. With proper wall ties, the two leaves support each other, distributing loads more effectively and increasing the durability of the wall.

(c) With the aid of a sketch, describe the construction of a cavity wall and indicate the position of wall ties.

In a cavity wall, the outer and inner walls are constructed parallel to each other with a space of about 50 to 100 mm between them. Wall ties are inserted across the cavity at regular vertical and horizontal intervals to connect both walls.

The cavity is kept clean during construction to avoid mortar bridging. At the base, weep holes are provided for drainage, and DPC is installed in both leaves to prevent rising damp. The wall ties slope slightly downward towards the outer wall to guide moisture away.

2. (a) What is the importance of curing in masonry construction?

Curing in masonry construction is the process of maintaining adequate moisture in the mortar and masonry units to allow proper hydration of cement. This helps in gaining maximum strength and durability.

It ensures proper bonding between the masonry units and the mortar, reducing the chances of cracks, shrinkage, and poor adhesion. Curing also improves the resistance of the wall to weathering and erosion.

(b) Explain four effects of poor curing of brick or block work.

Poor curing causes the mortar to dry out too quickly, resulting in weak joints that can easily crack or separate under stress.

It leads to insufficient hydration of cement, which reduces the overall strength of the structure and its ability to bear loads.

Improperly cured walls are more susceptible to water penetration, leading to dampness, mold growth, and structural decay over time.

It results in poor appearance of the masonry surface, including uneven coloring, chalky texture, and loose finishes.

(c) Outline the correct procedure for curing a newly constructed wall.

After laying the masonry units, the wall should be left to set undisturbed for 24 hours to allow initial setting.

Water should then be applied gently to the wall surface using a hose, spray, or wet hessian cloths. This should be done at regular intervals, especially in hot weather.

Curing should continue for at least 7 to 10 days to ensure full hydration of the cement. The wall should be kept moist at all times during this period.

Temporary shading or coverings may be used to prevent excessive drying due to wind or sunlight.

3. (a) Define the term "setting out" in bricklaying.

Setting out is the process of transferring the building plan from paper to the ground, marking the exact positions and dimensions of walls and other structural elements on the site.

It ensures that construction work begins at the correct location, at the right dimensions, and aligned according to the plan.

Setting out forms the foundation for the accuracy of the entire structure, helping avoid construction errors and material waste.

(b) State five tools used for setting out and explain their uses.

A measuring tape is used to measure lengths and mark dimensions accurately on the ground.

A line and pegs are used to mark straight reference lines and fix points for corners and edges of walls.

A builder's square is used to check right angles at corners, ensuring walls are laid out perpendicular to each other.

A plumb bob helps to check vertical alignment when transferring markings from ground level to higher levels.

A spirit level is used to confirm the horizontal or vertical accuracy of lines and surfaces during and after marking.

(c) Describe the procedure for setting out a rectangular building on site.

First, the base line is established along one side of the building using a line and pegs. This line is measured and fixed according to the plan dimensions.

A right angle is formed using the 3-4-5 triangle method or a builder's square to set the second line perpendicular to the first.

All four corners are marked and measured to ensure opposite sides are equal and diagonals are the same length, confirming a perfect rectangle.

Once all corners are pegged, string lines are tied tightly between them to mark the boundaries of walls. The position of internal walls and openings can also be marked using the same method.

4. (a) (i) What is a pier in wall construction?

A pier is a vertical structural member built into or alongside a wall to provide additional support and stability. It is usually wider and stronger than a normal wall section.

Piers may be part of the wall or stand as independent structures that take the load and transfer it to the foundation.

(ii) State three functions of a pier in a wall.

A pier increases the load-bearing capacity of a wall, especially in long spans without openings.

It helps resist lateral forces such as wind or earth pressure, making the wall more stable.

It provides anchorage and support for beams, arches, or other structural elements resting on the wall.

(b) With the aid of a sketch, differentiate between a freestanding wall and a retaining wall.

A freestanding wall is not supported laterally and stands by itself, often used for fences or garden walls. It is designed primarily to mark boundaries and provide separation.

A retaining wall is built to hold back soil or materials on one side, resisting lateral pressure. It is thicker and reinforced, often seen in sloped terrain or landscaping works.

(c) State four causes of failure in brick walls.

Settlement of the foundation can cause uneven support, leading to cracks and tilting of walls.

Poor workmanship, such as inadequate bonding or weak mortar, reduces the strength and stability of the wall.

Excessive loads beyond the wall's capacity can lead to crushing, cracking, or collapse.

Moisture penetration and poor drainage cause deterioration of mortar and bricks, leading to structural failure over time.

5. (a) What are the uses of cement in brick and block work?

Cement is used in mortar to bond bricks or blocks together, providing strength and stability to the wall.

It is also used in rendering and plastering to give a smooth, protective surface to internal and external walls.

Cement is used in concrete block production, where it acts as a binder holding aggregates together.

It improves the water resistance and durability of masonry structures, especially in exposed or damp areas.

(b) State four types of cement used in construction.

Ordinary Portland Cement (OPC) is the most commonly used type for general construction work.

Rapid Hardening Cement is used when early strength is needed, such as in repair works.

Sulfate Resistant Cement is used in areas exposed to high sulfate content like sewage and marine environments.

Portland Pozzolana Cement contains fly ash or other pozzolanic materials and is suitable for mass concrete works and water-retaining structures.

(c) Describe the properties of good quality cement suitable for masonry work.

Good quality cement should have a uniform gray color with a fine, smooth texture and no lumps or hard particles.

It should be fresh and have a manufacturing date within three months to ensure full reactivity and strength.

When mixed with water, it should form a smooth, plastic paste that sets gradually and gains strength over time.

It should conform to relevant standards like TBS or BS specifications, ensuring consistency, strength, and durability.

6. (a) (i) Define the term "foundation".

A foundation is the lowest part of a building structure that transfers the load from the building to the ground safely.

It ensures that the structure remains stable, level, and protected from settlement, sliding, or overturning.

(ii) Mention three types of foundations used in masonry construction.

Strip foundations are shallow, continuous strips of concrete under walls and load-bearing areas.

Pad foundations are isolated square or rectangular footings supporting individual columns or piers.

Raft foundations cover the entire building area and distribute the load evenly over a weak or soft soil surface.

(b) With the aid of a labeled sketch, describe a typical strip foundation.

A strip foundation is a linear structure laid below load-bearing walls. It consists of a trench filled with concrete, typically wider than the wall it supports.

The base of the trench is leveled, compacted, and concrete is poured to a required depth. The wall is then constructed directly above the hardened concrete strip.

Reinforcement may be added for strength, and DPC is placed above the foundation to prevent rising damp.

(c) State four factors to be considered before selecting a type of foundation for a building.

The type and bearing capacity of the soil determine whether shallow or deep foundations are suitable.

The total load from the structure, including live and dead loads, influences the design and size of the foundation.

The presence of groundwater or moisture affects material choice and foundation depth.

The type of building and number of floors affect the required foundation strength and layout.