THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

783 **BUILDING CONSTRUCTION**

Time: 3 Hour. **ANSWERS** **Year: 2015**

Instructions

1. This paper consists of sections **five (5)** questions.
2. Answer all questions.
3. Each question carries **twenty (20)** marks.
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.

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1. (a) Explain three reasons why concrete must be compacted immediately after placement.

Concrete must be compacted immediately to **remove entrapped air** within the mix. If left, these air pockets reduce the density and strength of the concrete, making it less durable.

Compaction ensures that the **concrete fully surrounds the reinforcement**, providing proper bonding and preventing corrosion due to exposure.

Immediate compaction also helps in **achieving a smooth and even surface finish**, reducing the likelihood of honeycombing and surface voids which affect structural appearance and integrity.

(b) Poor compaction leads to the formation of **voids and honeycombs**, which create weak zones that compromise the overall strength of the concrete structure.

It results in **poor bonding between concrete and reinforcement**, allowing moisture to penetrate and cause rusting of steel, which eventually leads to cracks and failure.

Concrete that is not properly compacted also becomes **more porous**, reducing its resistance to weathering, chemical attack, and wear over time.

(c) The **hand rodding method** is a simple technique used for small-scale or lightly reinforced sections, involving the manual insertion of rods to compact the mix.

Tamping is done using tamping bars or boards to level and compact concrete in shallow members like slabs and pavements.

The **mechanical vibration method**, using internal or external vibrators, is the most effective method for dense and reinforced concrete, ensuring uniform compaction throughout the mass.

2. (a) State four reasons why building regulations are important in construction projects.

Building regulations ensure **safety of occupants and workers** by providing clear guidelines on structural strength, fire protection, and stability.

They help in maintaining **uniformity and quality** in construction, ensuring buildings meet minimum standards regardless of location or contractor.

Regulations also protect the **environment and public health** by controlling issues like waste disposal, ventilation, and drainage.

They ensure **compliance with legal frameworks**, protecting clients and professionals from lawsuits or demolition orders due to unauthorized works.

(b) Ignoring building regulations may result in **structural failure**, as the building may not meet minimum safety standards.

The owner or contractor may face **legal penalties, fines, or stop-work notices** from authorities, delaying the project.

Poor compliance can also lead to **decreased property value**, as non-approved buildings are difficult to insure, sell, or finance.

(c) The site supervisor must ensure that all works are carried out **according to the approved drawings and specifications**, checking each phase before proceeding.

They are responsible for **coordinating inspections** by local authorities, ensuring that structural, electrical, and plumbing systems meet the required standards before covering or progressing.

3. (a) Define the term "construction joint" and state its purpose in reinforced concrete works.

A construction joint is a **planned discontinuity** in a concrete structure where a pour is stopped and resumed later. It allows for practical completion of work in phases without compromising the structural integrity.

Its purpose is to ensure **proper connection between two concrete placements**, allowing for controlled shrinkage, load transfer, and bonding between fresh and old concrete.

(b) Construction joints are required when **concreting is interrupted** due to time, equipment breakdown, or end of the workday.

They are also needed in **large slabs, beams, or walls**, where it's not practical to pour the entire section in a single continuous operation.

Another condition is when the concrete reaches its **initial set time**, making further compaction or finishing impossible, requiring a break before the next pour.

(c) Before placing new concrete, the surface of the old concrete must be **roughened or keyed** to improve mechanical interlock between the two layers.

The joint must be **cleaned of dust, laitance, and loose particles**, ensuring a strong and continuous bond between old and new concrete.

A bonding agent such as **cement slurry or epoxy** should be applied before pouring the fresh concrete to enhance chemical adhesion.

4. (a) Explain four causes of cracks in building walls.

Cracks can be caused by **differential settlement** of the foundation, where uneven ground movement stresses the walls and leads to breakage.

Shrinkage of materials, especially in concrete or plaster, occurs as water evaporates during curing, resulting in surface cracks.

Thermal expansion and contraction from temperature changes can stress rigid walls, especially when expansion joints are not provided.

Cracks may also result from **overloading** or structural design errors, where the wall is subjected to forces beyond its capacity.

(b) To prevent cracks, proper **foundation design and soil investigation** should be conducted to ensure the ground can support the load evenly.

Providing **adequate curing and using correct mix ratios** helps prevent shrinkage-related cracks during early stages of construction.

Expansion joints should be installed in long walls or large structures to **absorb movement** due to thermal expansion and contraction.

(c) One sign of serious structural cracks is when they are **wider than 5 mm and continue to grow over time**, indicating ongoing movement or failure.

Cracks that run **diagonally from corners of doors and windows** suggest settlement or frame distortion, which may point to foundation problems.

Another indicator is **water seepage through cracks**, which not only weakens the structure but also causes dampness, mold, and decay of interior finishes.

5. (a) Define the term "formwork" and explain its role in concrete construction.

Formwork is a **temporary structure or mold** used to shape and support freshly poured concrete until it sets and gains strength to support itself.

Its role is to **hold the concrete in the desired shape and position**, ensuring dimensional accuracy, smooth surfaces, and structural alignment during curing.

(b) Good formwork should be **strong and stable**, capable of bearing the weight of concrete and reinforcement without collapsing or deforming.

It must be **leak-proof** to prevent loss of water or slurry from the concrete mix, which affects strength and surface finish.

Formwork should be **easy to assemble and dismantle**, saving time and labor costs, especially for repeated use.

The material should be **durable and reusable**, particularly in large or repeated projects, to reduce overall formwork expenses.

(c) Early removal of formwork can cause **collapse or deformation**, as the concrete may not have achieved sufficient strength to support its own weight and any imposed loads.

It may lead to **cracks or sagging**, especially in beams, slabs, or cantilevered structures where proper curing and strength development is crucial.

Premature stripping can also **damage concrete surfaces**, exposing reinforcement or leaving an uneven finish, requiring costly repairs or rework.