THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

783 **BUILDING CONSTRUCTION**

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

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.

1. (a) Explain three reasons why reinforced concrete is preferred over plain concrete in high-rise building construction.

Reinforced concrete has **greater tensile strength** than plain concrete. While concrete is strong in compression, it is weak in tension. The inclusion of steel reinforcement allows it to resist both compression and tensile forces, which is essential in tall buildings exposed to wind, loads, and seismic movement.

It also offers **structural flexibility**, making it possible to construct longer spans and thinner members without compromising safety. This allows designers to create more open spaces and reduce the number of supporting columns.

Additionally, reinforced concrete provides **durability and fire resistance**. The combination of steel and concrete allows structures to withstand harsh environmental conditions and delays structural failure during fire, making it safer for multistorey buildings.

(b) One method to improve the workability of concrete is by **adding water-reducing admixtures** (plasticizers), which make the mix more fluid without increasing the water content. This improves flow and reduces segregation.

Another method is **adjusting the aggregate size and grading**. Well-graded aggregates reduce voids, improving compaction and ease of placement.

A third method is using **superplasticizers**, which significantly increase workability for the same water-cement ratio. They are especially useful for dense reinforcement areas where concrete must flow easily.

(c) Timber formwork is **less durable** compared to steel or plastic. It deforms or deteriorates quickly under repeated use, especially when exposed to moisture.

It also requires **more labor and time** for fabrication, assembly, and removal, making it uneconomical for large projects where speed and reuse are important.

Lastly, timber formwork has a **higher risk of fire** and damage, especially if stored or handled carelessly, making it less ideal for safety on large-scale sites.

2. (a) State four functions of a substructure in a building.

The substructure **supports the superstructure**, transferring loads from the building to the ground safely and evenly.

It **prevents settlement** by spreading the load across a larger area of soil, reducing pressure on weak soils.

It acts as a **barrier against moisture and ground movement**, preventing water ingress and protecting interior finishes.

The substructure also allows for the **installation of underground services**, such as drainage pipes and electrical conduits.

(b) Soil investigation begins with **desk study and site reconnaissance** to gather background information and understand the terrain.

Field tests such as **trial pits and boreholes** are dug to examine soil layers and collect samples for laboratory testing.

Laboratory tests are performed to determine **soil bearing capacity, moisture content, and type**, which are used to design suitable foundations.

Lastly, engineers **analyze and interpret results**, preparing a soil report that guides foundation selection and structural design.

(c) One common cause of settlement is **poor soil compaction**, where the ground beneath the building compresses over time under load.

Another cause is **uneven moisture variation**, such as in clay soils, which expand or shrink depending on water levels.

One effect of settlement is the appearance of **cracks in walls and floors**, which may weaken the building's structure and affect finishes.

Another effect is **door and window misalignment**, where frames become skewed, making them hard to open or close due to movement.

3. (a) What is scaffolding? Mention four factors to consider when selecting a type of scaffolding for a construction site.

Scaffolding is a **temporary structure** used to support workers and materials during construction, maintenance, or repair of buildings.

One factor to consider is the **height of the building**. Taller buildings require more stable and stronger scaffold types like tubular steel scaffolding.

Another factor is the **type of work to be done**, such as bricklaying, plastering, or painting, which may demand different scaffold configurations.

The **terrain or ground conditions** influence the base support design. Sloped or soft ground requires wide bases or adjustable legs.

Lastly, the **duration of the project** determines whether to use reusable metal scaffolds or temporary timber ones.

(b) One disadvantage of bamboo scaffolding is its **low strength and durability** compared to steel. It cannot support heavy loads or withstand strong winds effectively.

Another disadvantage is **decay and insect attack**, especially in wet or humid climates, which weaken the structure and reduce its safety.

A third issue is the **lack of standardized joints and connectors**, making assembly and disassembly more complex and risky in multistorey structures.

(c) Use **base plates or sole boards** to distribute load evenly and prevent sinking on soft or uneven ground.

Ensure scaffolding is **tied to the building** at regular intervals to maintain lateral stability and resist swaying.

Workers must regularly **inspect and adjust scaffold levels**, ensuring no part is leaning or overstressed by uneven weight distribution.

4. (a) Describe four essential considerations when selecting a site for construction in a flood-prone area.

The site should have **sufficient elevation** to avoid being submerged during floods. Sites below known flood levels should be avoided or raised with fill material.

Proper **drainage design** must be incorporated to allow quick water discharge, using channels, slopes, and soak pits.

Construction should use **flood-resistant materials** such as reinforced concrete, masonry blocks, and waterproof finishes to reduce damage.

The proximity to **emergency access roads and services** should be considered to ensure the site remains reachable during flooding events.

(b) Inspection chambers allow for **access to underground drainage systems** at key points such as bends, junctions, or changes in slope.

They make it easier to **inspect, clean, or repair** blocked drains without digging up large portions of the site, saving time and cost.

They also **regulate flow direction**, ensuring waste is directed correctly and minimizing the risk of backflow or overflow.

(c) One problem from poor wastewater disposal is **contamination of drinking water**, especially if waste seeps into nearby water sources or shallow wells.

Another issue is **health hazards**, as stagnant waste attracts disease-carrying insects like mosquitoes and flies, increasing the risk of malaria or cholera.

Poor disposal also leads to **unpleasant odors and unsightly surroundings**, reducing the quality of life and property value in residential areas.

Lastly, **soil pollution and degradation** may occur, making land less fertile and increasing environmental risks over time.

5. (a) Define the term "sound insulation" and explain its importance in residential buildings.

Sound insulation refers to **the ability of a building component** (like a wall, floor, or ceiling) to prevent the transmission of sound from one room to another.

It is important in residential buildings because it **enhances privacy**, allowing occupants to live, sleep, and work without disturbance from other rooms or external noise.

It also improves **comfort and mental well-being**, reducing stress and fatigue caused by constant exposure to unwanted sounds.

(b) One method of controlling sound is using **dense and thick wall materials** like concrete or solid bricks, which absorb sound waves effectively.

Another method is **adding insulation materials** like mineral wool or foam inside wall cavities, which disrupt sound transmission.

Walls can also be built with **double layers of plasterboard** separated by an air gap or resilient channels to absorb vibrations.

Using **sealing strips around doors and windows** prevents sound leakage through small openings and gaps.

(c) Glass walls allow **excessive solar gain**, causing indoor spaces to overheat in tropical climates where temperatures are already high.

They offer **low insulation against noise**, especially if single-glazed, leading to more disturbance from external environments.

Lastly, glass may offer **reduced privacy** unless tinted or frosted, which may not always be desirable or cost-effective in residential areas.