THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION

783 **BUILDING CONSTRUCTION**

Time: 3 Hour. **ANSWERS** **Year: 2001**

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) Define foundation and explain its purpose in building construction.
A foundation is the lowest structural part of a building that transfers the total load from the structure safely into the ground. It serves as the base that supports all structural elements above it. The foundation ensures that the load is distributed evenly across the soil to prevent uneven settlement, which can lead to cracks or structural failure. Additionally, a foundation provides stability against environmental forces such as wind or minor earthquakes and helps protect the structure from moisture and ground movement.

(b) (i) State three types of shallow foundations used in low-rise buildings.
One type is the strip foundation, which is commonly used beneath load-bearing walls. It consists of a continuous strip of concrete that distributes the weight of the wall along its entire length. Strip foundations are economical and suitable for stable soil with good bearing capacity.

Another type is the pad foundation, which supports individual point loads such as columns. It is made of a square or rectangular concrete base placed beneath a column to spread the load over a larger area. This type is ideal where columns are spaced apart and loads are concentrated.

The third type is a raft or mat foundation, which is a thick concrete slab covering the entire footprint of the building. It distributes the load from several columns and walls over a large area, making it suitable for soils with low bearing capacity or for high-load structures.

(ii) Give two factors that influence the choice of foundation type.
One factor is the soil type and bearing capacity. Strong, compact soils may allow for shallow foundations like strip or pad foundations, while weak or expansive soils may require raft or deep foundations to spread loads more effectively.

Another factor is the type and size of the building. A small residential house may only require a shallow foundation, while a multi-story commercial structure may need a more robust solution to carry heavier and more complex loads.

(c) Mention three effects of using an unsuitable foundation for a building project.
Using the wrong type of foundation can cause differential settlement, where different parts of the building sink at different rates, resulting in visible cracks in walls, floors, and even structural failure.

It can also lead to instability or collapse, especially if the foundation cannot handle the building's load or soil conditions change unexpectedly, such as during heavy rains or floods.

Lastly, an unsuitable foundation increases maintenance and repair costs, as continuous patching of cracks or reinforcement of structural parts becomes necessary over time to address the resulting damage.

2. (a) What is formwork in construction?
Formwork refers to the temporary or permanent molds used to shape and support fresh concrete until it gains enough strength to stand on its own. It plays a critical role in determining the final appearance and structural quality of concrete elements. Good formwork ensures that concrete sets in the correct dimensions and finishes, avoiding bulges, voids, or misalignments. It must be strong enough to bear the weight of wet concrete and construction loads, yet flexible enough for removal after curing.

(b) (i) Identify four properties of good formwork material.
First, it must be structurally strong and rigid, able to withstand the pressure exerted by fresh concrete without deformation or collapse.

Second, it must be dimensionally accurate and stable, maintaining its shape and size despite exposure to moisture, concrete, or temperature variations.

Third, good formwork should be easy to assemble and dismantle, allowing reuse across multiple parts of the site, thus saving time and resources.

Fourth, it should have a smooth surface finish that doesn't stick to the concrete. This ensures easy removal and reduces surface defects on the cured concrete.

(ii) State two reasons why proper formwork removal timing is important.
Removing formwork too early may result in structural failure, as the concrete might not have reached the minimum required strength to support its own weight or imposed loads.

On the other hand, delaying removal can damage the surface of the concrete, especially if the formwork has absorbed moisture or hardened onto the surface, leading to cracking or detachment when pulled away.

(c) Explain three challenges commonly encountered in formwork installation on site.
One challenge is poor alignment and measurement, which can lead to mispositioned beams or walls that don't meet design requirements, resulting in time-consuming corrections.

Another is leakage of concrete slurry, especially if the joints in the formwork are not properly sealed. This weakens the concrete near the edges and can lead to honeycombing or incomplete filling.

A third challenge is improper bracing or support, which can cause the formwork to collapse or shift while concrete is being poured, resulting in both safety hazards and structural defects.

3. (a) Explain the importance of site clearance before commencing building works.
Site clearance is a crucial initial step in construction where all physical obstructions such as trees, vegetation, rubbish, stones, or old structures are removed from the construction area. This process ensures that the site is safe, accessible, and ready for layout and excavation. Without proper site clearance, setting out can be inaccurate, construction activities may be hindered, and the risk of accidents increases significantly.

(b) (i) List three tools used during site clearance.
A machete or slasher is used to cut grass, weeds, and small shrubs, making the surface visible and walkable.

A pickaxe is helpful in uprooting small trees, breaking through compacted earth, and removing rocks embedded in the soil.

A wheelbarrow is essential for transporting debris, soil, and waste materials from the site to designated disposal areas.

(ii) Give two environmental considerations during site clearing.
One consideration is preventing soil erosion by avoiding excessive removal of vegetation on sloped areas, which helps maintain ground stability.

Another is proper disposal of organic and inorganic waste, ensuring materials like plastics, asbestos, or oils are not left behind to contaminate soil or water.

(c) Describe three risks associated with poor site clearance practices.
Poor clearance can lead to accidents and injuries, as workers may trip over hidden debris or encounter sharp or hazardous materials.

It can cause construction delays, especially if buried objects or undetected roots interfere with excavation or foundation laying.

Poor clearance also leads to infestation by pests, such as snakes or rodents hiding in uncut grass or waste, which poses health and safety risks to workers.

4. (a) Define the term "construction contract."
A construction contract is a legally binding agreement between the client (project owner) and the contractor, outlining the terms and responsibilities for executing a construction project. It covers details such as the scope of work, timeline, payment terms, penalties, dispute resolution, and specifications. Contracts are essential tools that protect both parties' interests and help avoid misunderstandings during project execution.

(b) (i) Name three types of construction contracts used in the building industry.
A lump-sum contract sets a fixed total cost for all work, regardless of actual expenses. It suits well-defined projects.

A cost-plus contract allows reimbursement of the contractor's actual costs plus an agreed percentage as profit. It suits projects with uncertain scope or design changes.

A unit price contract pays the contractor based on actual quantities of work done, useful in projects where the exact amount of work is hard to determine in advance.

(ii) Give two advantages of using written contracts in construction.
Written contracts provide legal clarity and protection, enabling both parties to refer to agreed terms in case of conflict or claims.

They also establish clear expectations and communication, specifying deliverables, deadlines, and quality standards, which leads to smoother project coordination.

(c) Explain three problems that may arise when a project is started without a formal contract.
There may be disputes over responsibilities or payments, as there's no documented reference point to settle disagreements.

The contractor may deliver poor quality work due to lack of defined standards, causing safety risks or legal action.

Also, the project may face delays or abandonment, especially if disagreements over scope or costs occur midway without any resolution process in place.

5. (a) What is scaffolding?
Scaffolding is a temporary structure used on construction sites to support workers and materials when working at height. It enables safe access to higher parts of a building during tasks like plastering, painting, or bricklaying. Scaffolding must be stable, secure, and constructed with appropriate materials such as steel or treated timber, and it must comply with safety regulations to prevent accidents.

(b) (i) Mention four essential parts of a typical scaffold.
Standards are the vertical poles that carry the load of the scaffold to the ground.

Ledgers are the horizontal tubes that connect the standards and support the working platforms.

Braces are diagonal members that provide lateral stability and prevent swaying or collapse.

Platforms or decks are the planks placed across ledgers to create the surface where workers stand or place materials.

(ii) List two safety precautions to observe when using scaffolding.
All scaffolds must be erected on firm, level ground and securely braced to avoid collapse.

Workers should always use guardrails and personal protective equipment such as safety harnesses to prevent falls.

(c) Describe three possible consequences of unsafe scaffolding on construction sites.
Unsafe scaffolding can lead to fall-related injuries or deaths, especially if guardrails are missing or the structure is unstable.

Falling materials from unstable platforms may injure workers below or damage property, posing a liability risk.

The project may suffer work stoppages, penalties, or legal action, particularly if government safety standards are violated or accidents occur.