THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

071 BUILDING CONSTRUCTION

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2009**

Instructions

1. This paper consists of sections A, B and C with total of fifteen questions

2. Answer all questions in section A and B, and two questions in section C.

i. All construction sites should be fenced to avoid vandalism, therefore it
A. protects the outsiders from entering the construction site
B. protects loss of goods and materials
C. protects injury to children
D. protects other people from seeing construction works
E. provides security for workers and materials

The correct answer is E. Construction sites contain valuable materials, machinery, and equipment that need protection from theft, vandalism, and unauthorized access. Proper fencing ensures the security of workers and materials, minimizing risks of accidents, loss, or damage.

ii. The method of measuring the suitability of fresh concrete is known as
A. Sponge test
B. Workability test
C. Slump test
D. Mobility test
E. True slump test

The correct answer is C. The slump test is widely used to measure the workability and consistency of fresh concrete. It helps in determining whether the concrete has the right fluidity for easy placement and compaction without excessive segregation or bleeding.

iii. The amount of excavation required at a site is determined by
A. Profiles
B. Spoil rails and spoil kept back from trench
C. Building line
D. Timbering to trenches
E. Sight rails and boning rods

The correct answer is E. Sight rails and boning rods are used to establish accurate excavation levels and depth by providing reference points. They ensure that excavation follows the required dimensions and maintains uniformity throughout the site.

iv. Sludge soak pit is defined as the one
A. in which effluent from the septic tank is discharged
B. in which treated sewage from junction of house drains is discharged
C. provided at the junction of house drains
D. in which the sewage effluent from the house drain is directly discharged
E. that disconnect sullage drain from drain

The correct answer is A. A sludge soak pit is designed to receive effluent from a septic tank and allow it to percolate into the soil for further natural filtration. It helps in managing wastewater disposal while reducing environmental contamination.

v. The tendency of water to rise to the surface of freshly laid concrete is

A. Segregation
B. Bulking
C. Hydration
D. Entrained air
E. Bleeding

The correct answer is E. Bleeding occurs when excess water in freshly mixed concrete rises to the surface due to the settling of solid particles. This phenomenon weakens the concrete surface, reducing its durability and leading to issues such as cracking and poor bonding with subsequent layers.

vi. Terrazzo flooring can be defined as
A. Small pieces of broken tiles mixed together with cement
B. Special concrete containing cement and marble chips of different colours mixed in good proportions
C. Superior flooring where marble slab is laid over cement mortar
D. Special concrete containing tiles and marbles
E. Special laminated stones, well-shaped, laid over cement mortar

The correct answer is B. Terrazzo flooring is a composite material made by mixing marble chips, granite, or glass fragments with cement or epoxy resin. This mixture is then polished to create a smooth, durable, and visually appealing surface commonly used in commercial and residential buildings.

vii. One of the functions of retaining walls is to
A. serve as a decoration to the building
B. allow further construction
C. protect land slides on sloping sites
D. reinforce concrete content for
E. prevent the penetration of moisture to the internal surface of the wall

The correct answer is C. Retaining walls are primarily built to hold back soil on sloped terrains, preventing landslides and erosion. They provide structural support to unstable ground, ensuring the safety of adjacent buildings and infrastructure.

viii. The duration before removing form works to in-situ casted lintels and beams depends on the following factors
A. Cement type used, shape of structure, load, and humidity
B. Cement type used, curing position, form work, and humidity
C. Cement type used, reinforcements, curing, and humidity
D. Cement type used, position of form work, shape of structure
E. Cement type used, mixing duration, curing, and humidity

The correct answer is C. The removal of formwork depends on factors such as the type of cement, reinforcement used, and curing conditions. Proper curing ensures that the concrete gains adequate strength before formwork is removed, preventing collapse or deformation of structural elements.

ix. The following are requirements of partition walls except that they should
A. be strong enough to carry imposed loads
B. be fire-resistant to resist impacts subjected by occupants
C. have the capacity to support some wall fixtures
D. be as light as possible
E. be used as a sound barrier, especially when it divides two rooms

The correct answer is D. Partition walls are meant to divide spaces without bearing heavy loads. While they should be sturdy, they are typically designed to be lightweight to facilitate easy installation and minimize unnecessary structural stress.

x. Water closets as part of sanitary fittings is defined as
A. Special sink used to collect water for toilet use
B. A device used in the toilet and remains full of water
C. Device used to receive and discharge human excreta directly from the closet
D. A device used for fittings which disconnect sullage drain
E. Cisterns used for flushing
The correct answer is C. A water closet is a plumbing fixture designed to receive human waste and discharge it directly into the drainage system. It is commonly connected to a sewer or septic system and equipped with a flushing mechanism to maintain hygiene and sanitation.

3. Why is it necessary to clear turf and vegetable soil from the land before any construction begins?

i. Removing turf and vegetable soil eliminates organic matter that can decompose and cause settlement, leading to structural instability.
ii. It ensures a firm foundation by exposing compact, load-bearing soil that can support the building.
iii. Prevents excessive moisture retention, which could weaken the foundation and lead to damp conditions in the building.
iv. Reduces the risk of termite infestation, which could damage wooden structural elements in the building.

4. List down four (4) stages of building construction cycle.

i. Site preparation and foundation work
ii. Structural framework construction
iii. Installation of mechanical, electrical, and plumbing systems
iv. Finishing work, including plastering, painting, and flooring

5. Briefly explain anti-termite treatment as related to site preparation.

Anti-termite treatment is a process applied to soil, masonry, and wood structures to prevent termite infestation. The treatment involves applying chemical solutions or insecticides to the soil before laying the foundation. This creates a chemical barrier that prevents termites from reaching the building's structural components. It also includes treating wooden elements with anti-termite preservatives to enhance durability and prevent damage.

6. Mention four (4) reasons for performing dewatering in a construction site.

i. To lower the water table and provide a dry working area for foundation construction.
ii. To improve soil stability and prevent excessive ground movement or collapse.
iii. To allow proper curing and setting of concrete without interference from groundwater.
iv. To ensure safety by reducing the risk of water-related hazards such as soil erosion and flooding.

7. Define the following terms:

i. Water-cement ratio – The ratio of the weight of water to the weight of cement used in a concrete mix. It determines the strength and workability of the concrete. A lower ratio results in stronger concrete, while a higher ratio increases workability but may weaken the structure.

ii. The main reason for bending reinforcement ends when used in beams – Bending reinforcement ends enhances anchorage and ensures a firm grip between the reinforcement bars and the surrounding concrete. This prevents the bars from slipping under loads, increasing the strength and durability of the structure.

8. Briefly explain arches as used in wall openings.

Arches are curved structures used to span openings such as doors and windows, distributing loads efficiently. They transfer the weight of the structure above the opening to the supporting walls or columns. Arches enhance aesthetics, improve structural integrity, and allow wider openings without the need for lintels.

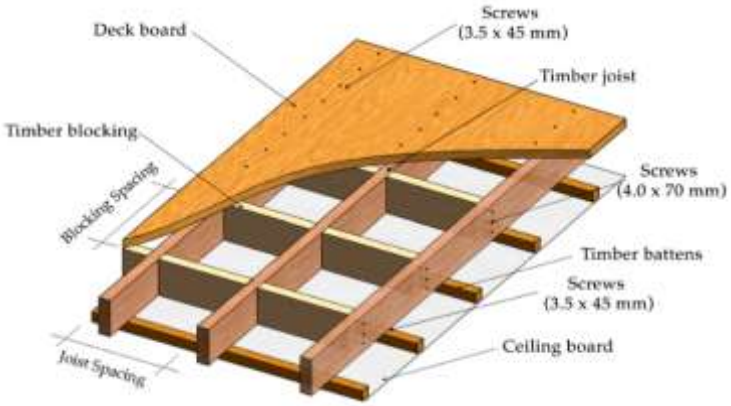
9. Define the following terms as used in staircase construction:
i. Flight – A continuous series of steps between two landings in a staircase. It allows movement from one floor level to another.
ii. Soffit – The underside of a staircase or arch, often finished with plaster or decorative materials.
iii. Baluster – A vertical post supporting the handrail, providing safety and aesthetic appeal.
iv. Nosing – The projecting edge of a stair tread that extends slightly beyond the riser for improved grip and safety.
10. Sketch a timber-raised ground floor and show the following parts:

A timber-raised ground floor, also known as a suspended timber floor, is an elevated flooring system designed to prevent moisture ingress and provide ventilation beneath the floor structure. This construction

method is particularly advantageous in areas with high groundwater levels or where damp conditions prevail.

key components:

- sleeper wall – these are low, supporting walls built from masonry, known as sleeper or tassel walls. they elevate the floor joists above the ground, creating a void that facilitates air circulation and prevents dampness from affecting the timber components.
- floor joists – horizontal structural members that span between sleeper walls or the main walls of the building. they support the floorboards and distribute loads to the supporting walls.
- floorboards – the finished surface of the floor, attached directly to the floor joists. they provide the walking surface and can be made from various types of timber, offering both structural support and aesthetic appeal.
- wall plate – a horizontal timber member laid along the top of the sleeper wall. it provides a flat, level surface onto which the floor joists are fixed, ensuring even distribution of loads and stability of the floor structure.



11. Mention four (4) main ways by which moisture enters into the building.

i. Capillary action – Moisture rises from the ground through pores in masonry materials.
ii. Condensation – Moisture forms inside the building when warm air meets cold surfaces.
iii. Leakage – Water enters through cracks, roof leaks, and poorly sealed joints.
iv. Water penetration – Rainwater seeps through porous walls, windows, and doors.

12. Briefly explain curing of building materials.

Curing is the process of maintaining adequate moisture, temperature, and time conditions for freshly placed concrete, mortar, or plaster. It allows proper hydration of cement, leading to increased strength and

durability. Methods of curing include water curing, membrane curing, and steam curing. Proper curing prevents cracks, shrinkage, and ensures long-term performance of building materials.

13. a) i. Describe the term "Traps" as applied to drainage systems.

A trap is a U-shaped, S-shaped, or P-shaped plumbing fixture designed to retain a small amount of water in its bend, preventing foul gases from the sewer from entering a building. It allows wastewater to flow smoothly while acting as a seal against odors and pests. Common types of traps include P-traps, S-traps, and bottle traps used in toilets, sinks, and drainage systems.

ii. Sketch a well-labeled manhole with an intercepting trap.

(sketch required)

b) i. What is plastering in building construction?

Plastering is the process of applying a smooth or textured layer of cement, lime, or gypsum mortar over walls, ceilings, and other surfaces to protect, strengthen, and enhance their appearance. It provides a uniform finish, covers imperfections in masonry, and improves resistance to weathering and moisture.

ii. Outline the four objectives of plastering.

i. To provide a smooth and even surface for painting or decoration.
ii. To protect walls from environmental factors like rain, heat, and humidity.
iii. To improve the durability and strength of masonry surfaces.
iv. To enhance aesthetics by covering irregularities, joints, and rough textures.

c) State the two factors upon which the choice of foundation for domestic buildings depends.

i. Soil type and bearing capacity – The selection of foundation depends on whether the soil is sandy, clayey, or rocky. Stronger soils can support shallow foundations, while weaker soils may require deep foundations.

ii. Load and building structure – The weight of the building, number of floors, and load distribution determine whether a shallow foundation (strip, raft, or pad) or a deep foundation (pile or pier) is necessary.

14. a) Design a half-turn (dog-leg) stair for a residential house in which the vertical distance between each floor is 3.40 m. The size of space for the stair is limited to 2.5 m × 5.0 m. Adopt:

- 2 RISE + 1 x TREAD = 630 mm
- Tread = 290 mm
- Width of landing space = 1.20 m

b) Make a neat sketch of the plan of a stair designed in (a) above and show location and dimensions for the following:

- The limited space for the stair (2.5 m × 5.0 m)
- The passage space before climbing
- The space covered by steps in the first flight
- The landing space
- Direction of movement from the ground floor upwards

15. a) With the aid of sketches, describe the following items:

i. Skeleton core flush door – A type of lightweight door with a solid or hollow core made of timber or particleboard, covered with plywood or veneer. It provides a smooth surface, making it ideal for interior use.

ii. Skirting to walls – A board fixed at the bottom of an interior wall to cover the joint between the wall and floor, protecting the wall from damage and enhancing aesthetics.

iii. Coping to walls – A protective covering placed on top of a wall to prevent water penetration. It is often sloped or shaped to drain water away and protect masonry from weathering.

b) Draw a section through a window opening and show the following parts:
A section through a window opening encompasses several critical components that ensure structural integrity, weather resistance, and aesthetic appeal. Below is a detailed description of each part:

- head of opening – this is the uppermost horizontal element of the window opening, often comprising a lintel that supports the wall above the window. it provides structural support and ensures that loads are properly transferred around the window frame.
- window frame – the framework that holds the window panes in place, typically constructed from materials such as wood, upvc, or metal. the frame fits within the window opening and is secured to the surrounding structure, providing a stable mount for the glazing.
- pre-cast concrete sill – located at the base of the window opening, the sill is a horizontal ledge made from pre-cast concrete. it serves to shed rainwater away from the wall and window, preventing water ingress. the sill often projects beyond the wall face and includes a throating to direct water away from the structure.
- throating – a groove or channel cut into the underside of the window sill's projecting edge. the throating prevents rainwater from running back towards the wall by causing it to drip off the edge, thereby protecting the wall from moisture damage.