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: 2014**

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. The strength of a brick wall depends on
A units of brick and mortar from which it is built
B number of block courses
C mortar joints of a wall
D foundation of a building
E type of plaster applied to the wall

The correct answer is A units of brick and mortar from which it is built because the strength of a brick wall is primarily determined by the quality of bricks and the type of mortar used in bonding them together.

II. What are the two classes of walls?
A External and internal walls
B Low and high walls
C Brick and block walls
D Partition and enclosed walls
E Non-load and load-bearing walls

The correct answer is E Non-load and load-bearing walls because walls are classified based on their structural function, where load-bearing walls support structural loads while non-load-bearing walls serve as partitions.

III. In designing a building, the following factor should be considered for proper orientation.
A Easy access to all spaces
B Availability of electricity
C A site plan to be on level surface
D Shape of a building

The correct answer is C A site plan to be on level surface because a properly leveled site ensures stability, proper drainage, and cost-effective foundation construction.

IV. The component providing a solid level surface for screed and finishing to be applied is known as
A damp-proof membrane (DPM)
B concrete bed
C hard core
D earth rammed floor
E timber

The correct answer is B concrete bed because it provides a smooth and solid base for floor finishes such as tiles, screeds, or carpets.

V. Which one among the following is not a functional requirement of a floor?
A Durable
B Fire resistant

C Moisture resistant
D Thermal resistant
E Sound insulator

The correct answer is B Fire resistant because floors are generally not designed primarily to resist fire but to bear loads, insulate from moisture, and provide durability.

VI. Why is the process of ramming in excavated trenches done?
A To prevent water from entering the trench
B To increase the strength of the base
C To prevent sand granules from wind erosion
D To obtain the level base

The correct answer is B To increase the strength of the base because ramming compacts the soil, reducing voids and increasing its bearing capacity for foundations.

VII. In the construction process, the site agent is the representative of
A Client
B Quantity surveyor
C Engineer
D Architect
E Contractor

The correct answer is E Contractor because the site agent supervises daily construction activities, ensuring that work progresses as per specifications.

VIII. Which one among the following is a binding agent in mortar and concrete?
A Cement
B Sand
C Aggregate
D Paint
E Sandstone

The correct answer is A Cement because it acts as a binder in mortar and concrete, holding the aggregates together.

IX. Spraying water to strengthen the fresh concrete is known as
A compaction
B rendering
C curing
D slump test
E bunching

The correct answer is C curing because it ensures adequate hydration, preventing early drying that could weaken the concrete.

X. Which one is the temporary structure used to support workers and materials during construction above the ground level?

A Shore
B Strut
C Bridle
D Scaffold
E Staircase

The correct answer is D Scaffold because it provides a safe platform for workers and materials during construction.

2. Matching items

List A

i. A brick laid with its breadth or width parallel to the face.
ii. A brick laid with its length parallel to the face.
iii. The lower surface of the brick when laid flat.
iv. A piece of brick cut parallel to its width to form a portion of a brick.
v. A brick moulded with a rounded angle.
vi. A triangular portion of a brick through its width and making an angle of 45-60°.
vii. A brick which is cut or moulded in such a way that an angle other than right angle is formed in plan.
viii. A triangular portion of a brick, such that half a header and half a stretcher are obtained on the adjoining cut faces.
ix. Cutting the brick longitudinally into two equal parts.
x. An indentation in the face of a brick to form a key for holding the mortar.

List B

A Bed
B Bat
C Mitred closer
D Bull nose
E Squint quoin
F Stretcher
G King closer
H Header
I Closer
J Frog
K Arris

L Half bat
M Quoin

i - F Stretcher
ii - H Header
iii - A Bed
iv - I Closer
v - D Bull nose
vi - G King closer
vii - C Mitred closer
viii - E Squint quoin
ix - B Bat
x - J Frog

3. Outline the four simple ways of checking the correctness of the foundation.

i. Visual Inspection – Checking the alignment, level, and depth of the foundation trenches to ensure they meet design specifications.
ii. Measuring Dimensions – Using measuring tapes and leveling instruments to confirm that the foundation is constructed according to the approved plan.
iii. Soil Testing – Conducting tests such as soil compaction and bearing capacity to verify that the ground can support the structure.
iv. Checking Reinforcement – Ensuring that steel reinforcements are properly placed and meet structural requirements before pouring concrete.

4.Describe the given two types of partition walls.

a. Timber partition wall

A timber partition wall is made using wooden studs, which are fixed vertically between a base plate and a head plate. Plywood or plasterboard is then attached to the frame to create a lightweight, non-load-bearing wall. Timber partitions are commonly used in residential and office buildings due to their ease of installation and modification.

b. Glass partition wall

A glass partition wall consists of tempered or laminated glass panels supported by aluminum or steel frames. These walls are used to create divisions while allowing light to pass through, making them popular in offices, commercial spaces, and modern homes. They provide an open and aesthetic appearance while offering sound insulation and privacy.

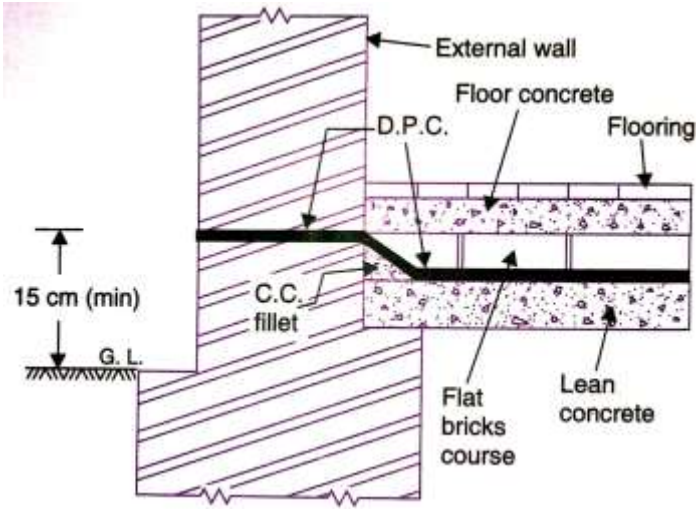
5. Briefly explain four causes of dampness in buildings.

i. Capillary Action – Water rises from the ground through porous building materials such as bricks and concrete, leading to dampness.
ii. Leakage – Poor plumbing, leaking roofs, or faulty drainage systems allow water to seep into the structure.
iii. Condensation – Moisture accumulates on walls and ceilings due to poor ventilation and temperature variations.
iv. Defective Damp-Proof Course – If the damp-proof membrane is damaged or missing, moisture can penetrate walls and floors.

6. Draw a neat sketch to show Horizontal D.P.C and Vertical D.P.C.

A horizontal damp-proof course is a waterproof layer placed at the base of walls to prevent rising dampness from the ground. A vertical damp-proof course is applied to the sides of walls or junctions where moisture penetration occurs from adjacent structures or soil.
A horizontal damp proof course (DPC) is a barrier installed horizontally within a wall, typically above ground level, to prevent moisture from rising through capillary action. It is commonly placed at the base of walls, just above the foundation, to block moisture from the ground.

A vertical damp proof course (DPC) is installed vertically, often at junctions between walls or where a wall meets a floor, to prevent lateral moisture penetration. This is essential in areas where external ground levels are higher than the internal floor level, as it stops moisture from entering the wall from the side.



7. Explain how the following may cause brick wall failure.

a. Impact

Impact damage occurs when external forces such as vehicle collisions, falling objects, or strong winds hit the brick wall, causing cracks or disintegration. Repeated impacts weaken the structure over time and may lead to partial or complete wall collapse.

b. Settlement

Settlement happens when the foundation of a brick wall moves due to poor soil conditions, waterlogging, or improper compaction. Uneven settlement results in cracks, misalignment, and structural instability. Severe settlement can cause the entire wall to lean or collapse.

8. Briefly explain how roofs and corrugated iron sheet roof covers are protected from the effects of:

a. Corrosion

i. Applying protective coatings such as paint, galvanization, or epoxy to prevent rust formation.
ii. Using stainless steel or aluminum fasteners to avoid electrochemical reactions that cause corrosion.
iii. Installing proper drainage systems to prevent water accumulation on the roof surface.
iv. Regular maintenance, including cleaning and repainting, to remove debris and oxidation layers.

b. Wind

i. Securing the roof sheets with strong fasteners and proper overlaps to prevent lifting during strong winds.
ii. Installing wind-resistant designs such as hip roofs and aerodynamic profiles to reduce wind pressure.
iii. Using reinforced roofing structures with additional bracing to withstand wind forces.
iv. Conducting routine inspections to identify and repair loose roof sheets before they become hazards.

9. Describe the following match boarded doors.

a. Ledged battened doors

A ledged battened door consists of vertical wooden planks held together by horizontal wooden members. It is a simple and cost-effective door, often used in rural houses, sheds, and storerooms.

b. Ledged, braced and battened doors

This type of door has vertical battens, horizontal ledges, and diagonal braces. The diagonal braces provide additional strength, preventing sagging or warping over time. These doors are used in heavy-duty applications such as barns and external doors.

10. Briefly describe the given types of staircases.

a. Timber staircase

A timber staircase is constructed using wooden steps supported by stringers. It is commonly used in residential buildings due to its aesthetic appeal and ease of construction. Timber staircases require proper treatment to prevent termite attacks and moisture damage.

b. Steel staircase

A steel staircase is made using steel stringers, steps, and handrails. It is preferred for commercial and industrial buildings due to its strength, durability, and fire resistance. Steel staircases can be prefabricated and installed quickly.

11. a. Describe the connections of an indirect cold water supply system for different uses in a residential house.

An indirect cold water supply system uses a storage tank to distribute water throughout the house. The connections include:

i. A main supply pipe from the municipal water source feeds the cold water storage tank, usually placed in the attic or roof space.
ii. From the storage tank, distribution pipes carry water to various fixtures such as sinks, showers, and toilets.
iii. A ball valve controls the water level in the storage tank, ensuring a continuous supply without overflow.
iv. A separate outlet provides water for appliances like water heaters and washing machines.

b. Briefly explain how the flow of water can be controlled in the supply system.

i. Stopcocks – Valves that allow users to turn the water supply on or off.
ii. Float Valves – Automatically regulate the water level in tanks by stopping the inflow when full.
iii. Pressure Reducing Valves – Control water pressure to prevent damage to pipes and fittings.
iv. Gate Valves – Used in main supply lines to control the overall flow rate.

12. a. What are the two classes of aggregates?

i. Fine aggregates – Small particles such as sand and crushed stone dust, used to fill voids in concrete and improve workability.
ii. Coarse aggregates – Larger particles such as gravel and crushed stone, providing strength and stability to concrete mixtures.

b. Outline the two general requirements of aggregates.

i. Strength – Aggregates should have high compressive strength to withstand load-bearing applications.
ii. Durability – Aggregates should resist weathering, chemical attacks, and physical wear over time.

13. a. Describe how Ordinary Portland Cement is manufactured.

i. Raw materials such as limestone and clay are crushed and blended in the correct proportions.
ii. The mixture is heated in a rotary kiln at temperatures of about 1400-1500°C to form clinker.
iii. The clinker is cooled and ground with gypsum to regulate the setting time.
iv. The final product is stored in silos before being packed in bags for distribution.

b. Outline how concrete is prepared by hand mixing.

i. Measure the required proportions of cement, sand, and aggregate.
ii. Mix the dry ingredients thoroughly on a clean, level surface.
iii. Gradually add water while mixing until a uniform consistency is achieved.
iv. Place the concrete in the desired formwork and compact it using a tamper.

c. Why should cement-made structures be cured after the initial setting time?

i. To ensure proper hydration and gain maximum strength.
ii. To prevent cracks caused by rapid drying.
iii. To enhance durability and resistance to weathering.
iv. To reduce shrinkage and increase the lifespan of the structure.

d. Explain advantages of reinforced concrete over mass concrete.

i. Higher Strength – Reinforced concrete can carry both tensile and compressive loads, unlike mass concrete which is weak in tension.
ii. Increased Durability – Steel reinforcement prevents cracking and improves the lifespan of the structure.
iii. Flexibility in Design – It allows for the construction of various shapes and sizes.
iv. Cost Efficiency – Although initial costs may be higher, long-term maintenance is lower due to its durability.

14. (a) The following are some dimensions of a certain house which is to be built:

- Depth of the strip foundation from the average ground level is 800 mm.
- Length of the house from each end is 17 m.
- Width of the house from end to end is 12 m.
- Thickness of the wall is 225 mm.

(i) Calculate the total volume of the soil which is to be excavated at the site all around the foundation of the house.

To calculate the total volume of the soil to be excavated, the excavation width must include the thickness of the wall plus the working space required for the foundation. The typical excavation width is generally about twice the wall thickness plus extra space for foundation work.

Volume of excavation is given by:

Volume = Perimeter of house × Excavation depth × Excavation width

(ii) Sketch a dimensioned section through the foundation.

A properly dimensioned sketch should include the foundation trench, foundation concrete, damp proof course, and wall thickness.

(b) If you are commissioned to supervise construction of the sketched foundation in (a):

(i) Calculate the cost of casting the footing if the rate per m^3 is Tshs. 100,000/=.

Cost = Volume of concrete footing × Rate per cubic meter

(ii) Calculate the trips of lorries of sand required for backfill after building the foundation wall provided that each lorry carries 5 m^3 of sand.

Trips of lorries = Volume of backfill required / Volume per lorry

15. (a) Describe the three classes of wooden doors.

i. Panel Doors – These doors consist of a wooden frame with panels made of wood, glass, or other materials fitted within it. They provide an aesthetic appeal and are commonly used in residential houses.
ii. Flush Doors – These doors have a flat, smooth surface made of plywood or fiberboard over a solid or hollow core. They are economical, lightweight, and often used in modern constructions.
iii. Battened and Ledged Doors – These consist of vertical wooden battens held together by horizontal ledges. They are simple, strong, and often used in rural homes, sheds, and storehouses.

(b) Elaborate the two methods for fixing glass into panels.

i. Putty Fixing – A layer of glazing putty is applied along the edges of the glass, which is then pressed into the panel. This method provides a strong and airtight seal.
ii. Beading Fixing – Wooden or metal beads are placed around the edges of the glass and secured with nails or screws, providing a secure and decorative finish.

(c) State three principles applied in fireplace design.

i. Proper Ventilation – The fireplace should have an efficient chimney or flue system to ensure proper air circulation and removal of smoke.
ii. Heat Efficiency – The design should maximize heat retention and distribution, using materials such as refractory bricks or cast iron to improve efficiency.
iii. Safety – The fireplace should be placed away from flammable materials, and a hearth should be included to protect flooring from heat and sparks.

(d) Outline four areas where manholes should be provided in the sewer.

i. At sewer junctions where two or more pipelines meet.
ii. At changes in sewer direction to allow access for cleaning and inspection.
iii. At regular intervals along straight sewer lines to facilitate maintenance.
iv. At points where there is a change in gradient or slope of the sewer line.