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: 2013**

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.

1. The horizontal member sub-dividing a window into two or more casements is known as
A mullion
B stile
C post
D transom
E middle rail

The correct answer is D transom because a transom is a horizontal structural member that separates window sections or casements.

II. The fire extinguisher which is not used on electrical fires is
A dry powder
B carbon dioxide
C foam
D vaporizing liquid
E water

The correct answer is E water because using water on an electrical fire can lead to electrocution and worsen the fire due to conductivity.

III. The suitable door to be used in an air-conditioned room is a
A collapsible door
B louvered door
C glazed door
D swinging door
E revolving door

The correct answer is C glazed door because glazed doors help in temperature control by minimizing air exchange while allowing light to pass through.

IV. Concrete is cured in order to
A achieve higher strength
B avoid cracking
C avoid bleeding
D remain wet
E remove dust

The correct answer is A achieve higher strength because curing ensures proper hydration of cement, leading to stronger and more durable concrete.

V. The horizontal projections at the head and sill of a door frame which are embedded into the side walls for fixing the frame are known as
A horns

B holdfasts
C jambs
D rebates
E hooks

The correct answer is A horns because they are the extended parts of the frame that provide anchorage into the masonry wall.

VI. Reducing the moisture content of timber to a level consistent with humidity of air is
A warping
B sawing
C seasoning
D cupping
E bowing

The correct answer is C seasoning because seasoning is the controlled drying of timber to make it suitable for construction and furniture use.

VII. What is the name of an opening left on a flat roof for the purpose of lighting?
A Dormer window
B Sky light
C Lantern
D Gable window
E Open sky

The correct answer is B Sky light because a skylight is a window installed on a roof to allow natural light into the building.

VIII. Which of the following bonds is the strongest?
A Stretcher bond
B Header bond
C Dutch bond
D English bond
E Flemish bond

The correct answer is D English bond because it consists of alternate layers of headers and stretchers, providing excellent strength and stability.

IX. One of the following is not among classifications of windows based on the method of opening
A Pivoted sash
B Side hung casement sash
C Vertically sliding sash
D Horizontal sliding sash

E Glazed casement sash

The correct answer is E Glazed casement sash because glazing refers to the material (glass) rather than the method of opening.

X. The function of cement in making concrete is to
A fill the voids between the aggregates
B bind the aggregates together
C produce the chemical reaction when mixed with water
D avoid segregation
E colour the concrete before use

The correct answer is B bind the aggregates together because cement acts as a binding agent that holds sand, gravel, and other aggregates to form solid concrete.

2. Matching items

List A

i. Under-burnt bricks indicated by a light color and a dull sound when struck
ii. Mis-shapen bricks due to excessive heating in the kiln
iii. Badly cracked and misshapen bricks due to rain falling on them
iv. Unsightly discoloration of bricks containing lime and iron sulphide
v. Discoloration of bricks by the formation of white deposit due to a large proportion of soluble salts
vi. The presence of excess carbonaceous matter in the clay
vii. Fine cracks on glazed bricks due to uneven shrinkage and expansion between glaze and clamps
viii. Fusing together of the clamp-burnt bricks to excessive heat
ix. Surface dark patches due to the presence of iron sulphide in the clay
x. Vitrified surfaces of bricks while the interior of brick remains black due to heating too rapidly in the kiln

List B

A Bloating
B Iron spotting
C Grizzling
D Crazing
E Scumming
F Hearing
G Shuffling
H Efflorescing
I Crushing
J Crozzling
K Lime noduling

L Laminating
M Shearing
N Sagging
O Clinkering

i - A Bloating
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3. Mention eight possible causes of industrial accidents.

i. Unsafe working conditions – Poor lighting, slippery floors, and faulty equipment increase accident risks.
ii. Lack of proper training – Employees unfamiliar with safety protocols are more prone to errors.
iii. Equipment failure – Malfunctioning machines can cause serious injuries.
iv. Human error – Fatigue, lack of concentration, or carelessness leads to workplace accidents.
v. Exposure to hazardous substances – Chemicals, fumes, and dust can harm workers if not handled correctly.
vi. Poor housekeeping – Cluttered work areas increase the likelihood of slips, trips, and falls.
vii. Fire hazards – Flammable materials and electrical faults can lead to workplace fires.
viii. Lack of proper personal protective equipment (PPE) – Without PPE, workers are exposed to potential injuries.

4. With the aid of a sketch, elaborate the application of raft foundation.

A raft foundation is a type of shallow foundation that spreads the load of a structure over a large area. It is used in weak soil conditions to prevent differential settlement. A proper sketch should include:

- Reinforced concrete slab covering the entire building footprint.
- Beams or ribs within the raft to increase strength.
- Uniform load distribution over the soil.

5. Define a "monolithic wall" and describe two examples.

A monolithic wall is a single, continuous wall constructed without joints or separations, making it strong and durable. Examples include:

i. Reinforced concrete walls – Cast as a single unit using concrete and steel reinforcement.
ii. Rammed earth walls – Made by compacting soil layers to form solid, joint-free structures.

6. (a) What is site investigation?

Site investigation is the process of assessing soil, rock, groundwater, and environmental conditions before construction begins. It helps determine the suitability of the site for the proposed structure.

(b) Outline three purposes of conducting site investigation.

i. To determine soil properties and bearing capacity for foundation design.
ii. To identify groundwater levels and drainage conditions.
iii. To detect potential hazards such as unstable ground or contaminants.

7. (a) State four functional requirements of ironmongery.

i. Durability – Must resist wear and corrosion for long-term use.
ii. Security – Should enhance safety by preventing unauthorized access.
iii. Aesthetic appeal – Should complement the design of doors, windows, and furniture.
iv. Ease of maintenance – Should be simple to clean, repair, or replace when necessary.

(b) Distinguish between rim latch and rim dead lock.

i. Rim latch – A surface-mounted locking mechanism that automatically locks when the door closes, usually operated with a handle.
ii. Rim dead lock – A more secure surface-mounted lock that requires a key to lock or unlock, providing better security.

8. Explain "scaffolding" as applied in building construction.

Scaffolding is a temporary framework used to support workers and materials during construction, repair, or maintenance of buildings. It provides a safe working platform at different heights.

9. State three points to remember when using scaffolding in construction.

i. Ensure scaffolding is properly erected on stable ground to prevent collapse.
ii. Use guardrails and toe boards to protect workers from falls.
iii. Regularly inspect scaffolding components for damage or weaknesses.

10. Briefly describe "timbering" as applied in foundation trenches.

Timbering refers to the use of wooden supports to prevent trench walls from collapsing during excavation. It is essential in deep or unstable soil conditions to maintain safety.

11. Differentiate ordinary excavation from deep excavation in foundation trenches.

i. Ordinary excavation – Shallow digging, usually less than 1.5 meters, for small structures or roads.
ii. Deep excavation – Involves digging more than 1.5 meters, requiring supports such as timbering or retaining walls.

12. (a) Explain the roofing membrane as applied in a flat roofing system.

A roofing membrane is a waterproof layer applied to flat roofs to prevent water leakage. It can be made from materials such as bitumen, PVC, or rubber and is essential for durability in flat roof designs.

(b) State three functional requirements of roof sheet coverings as used in conjunction with steel roof trusses.

i. Weather resistance – Must withstand rain, wind, and sun exposure.
ii. Lightweight – Should not impose excessive load on trusses.
iii. Fire resistance – Should be non-combustible for safety.

13. Outline two ways of testing drains and explain how each is carried out.

i. Water test – The drain is filled with water and checked for leaks. Any drop in water level indicates leakage.
ii. Smoke test – Smoke is pumped through the drainage system to detect leaks by observing where smoke escapes.

14. Calculate the volume of concrete ingredients for a lintel, which is 1200 mm long, 112 mm wide, and 150 mm deep; given that the concrete mix ratio is 1:2:4 (cement: sand: aggregates) by volume batching.

Volume of concrete = length × width × depth
Convert dimensions to meters:
$1.2 \times 0.112 \times 0.15 = 0.02016\ m^3$

To find the quantity of each ingredient:
Total parts in mix = 1+2+4 = 7
Cement = $(1/7) \times 0.02016 = 0.00288\ m^3$
Sand = $(2/7) \times 0.02016 = 0.00576\ m^3$
Aggregates = $(4/7) \times 0.02016 = 0.01152\ m^3$

15. (a) What are the functions of a fire place?

i. Provides heat for warming indoor spaces.
ii. Enhances aesthetic appeal in homes.
iii. Acts as a cooking area in traditional settings.
iv. Improves air circulation by venting smoke outside.

(b) Distinguish superimposed hearth from constructional hearth in a fireplace.

i. Superimposed hearth – A decorative layer added on top of the main hearth for visual appeal.
ii. Constructional hearth – The main fire-resistant base built to support the fireplace structure.

(c) List down four information that can be obtained from boreholes and outline three possible technical reasons for drilling boreholes in construction works.

Information:
i. Soil composition and bearing capacity.
ii. Groundwater levels.
iii. Subsurface rock formations.
iv. Presence of contaminants.

Reasons for drilling:
i. To assess foundation stability.
ii. To locate water sources for construction.
iii. To identify underground hazards.

16. (a) With the aid of neat sketches, classify beams based on their supports in construction works.

Beams can be classified as:
i. Simply supported beam – Supported at both ends.
ii. Cantilever beam – Fixed at one end and free at the other.
iii. Fixed beam – Rigidly held at both ends.
iv. Continuous beam – Extends over multiple supports.

(b) Outline five functional requirements of the water supply system.

i. Adequate pressure – Ensures water reaches all parts of the building.
ii. Clean and safe – Water must be free from contaminants.
iii. Leakproof – Pipes should prevent loss of water.
iv. Durability – System should withstand wear and environmental conditions.
v. Efficient drainage – Wastewater should be properly disposed of.

17. (a) The total length, width and depth of the strip foundation trench are 72.2 m, 700 mm, and 900 mm respectively.

(i) If a lorry can carry 3.5 m^3 of soil per trip, find the number of trips of hauling the excavated soil.

Volume of excavation = length × width × depth
$72.2 \times 0.7 \times 0.9 = 45.594\ m^3$
Trips required = $45.594 / 3.5 = 13.03 \approx 14$ trips

(ii) If the 230 mm thick mass concrete (1:3:6) is for footing of the strip foundation, how much sand (in m^3) will be required for the work?

Volume of concrete = $72.2 \times 0.7 \times 0.23 = 11.6342\ m^3$
Total mix parts = 1+3+6 = 10
Sand = $(3/10) \times 11.6342 = 3.49026\ m^3$

Thus, 3.49 m^3 of sand is required.