THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION.

784 **BRICKWORK AND MASONRY**

(SUPPLEMENTARY)

Time : 3 Hours **ANSWERS** **Year : 2005**

Instructions

1. This paper consists of sections **six (6)** questions.
2. Answer question number **one (1)** and any other **four (4)** questions.
3. Question 1 carries **thirty-two (32)** marks and the rest carries **seventeen (17)** marks each.
4. Non-programmable calculators may be used.
5. Cellular phones are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

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1. (a) Define the term “pier in masonry”.

A pier in masonry is a vertical structural member, usually rectangular or square, that supports loads from above, such as beams or arches. It is stronger than a regular wall section due to its increased thickness and mass.

(b) State four functions of masonry piers.

Piers support vertical loads from walls, beams, or arches. They act as intermediate supports in long walls to reduce bending. Piers provide stability against lateral forces such as wind or earth pressure. They can also serve as decorative architectural elements in building facades.

(c) Describe the construction process of an isolated brick pier foundation.

Construction begins by excavating a foundation pit at the desired location, with depth and width according to design. A concrete footing is laid to distribute the load safely to the soil. Bricks are then laid in successive courses on the footing, bonded properly with mortar. The pier is built vertically with occasional bond stones or headers to ensure stability. The top of the pier is finished level to support the structure above.

2. (a) What is meant by the term “groined vault”?

A groined vault is formed by the perpendicular intersection of two barrel vaults, creating a structural system with intersecting arches. This design efficiently transfers loads to the supporting piers or walls at the corners.

(i) Mention two advantages of groined vaults.

Groined vaults allow the construction of larger open spaces without intermediate supports. They are also structurally efficient, as the intersecting curves concentrate loads at the corners, reducing material usage compared to flat or barrel vaults.

(ii) With sketches, describe the construction of a groined vault.

Construction begins with erecting temporary timber centering along the paths of the two intersecting barrel vaults. Bricks or stones are laid along the curved forms, starting from the corners toward the center. The intersection of the two vaults forms a ridge called the groin. Mortar is applied to bond all units, and once the mortar sets, the centering is removed, leaving a self-supporting groined vault.

3. (a) Define “jointing in stone masonry”.

Jointing in stone masonry refers to the process of filling and finishing the gaps between stones with mortar to bind them together, prevent water ingress, and improve appearance.

(b) Mention three types of joints.

Flush joints are finished level with the stone face. Recessed joints are slightly indented from the stone surface. Weathered or weather-struck joints are sloped outward to shed water efficiently.

(c) Explain how joints affect strength and appearance.

Properly executed joints enhance structural strength by distributing loads evenly and preventing movement of stones. They also improve aesthetics by providing uniformity, clean lines, and a neat finish to the masonry surface. Poorly done joints can weaken walls and create unsightly surfaces.

4. (a) List four factors affecting mortar setting.

The water-cement ratio significantly affects setting time and strength. Ambient temperature influences curing speed, with extreme heat or cold causing improper setting. The type and quality of cement or lime used affect mortar performance. The proportion of sand in the mix also influences setting and workability.

(b) Explain two practices to ensure proper setting.

Using clean water and accurately proportioned materials ensures consistent mortar strength and proper setting. Protecting freshly laid mortar from direct sunlight, wind, or rain during curing helps prevent cracks and allows uniform hardening.

5. (a) What is meant by the term “arch ring”?

An arch ring is the curved layer of masonry units, such as bricks or stones, forming the visible surface of an arch. It is the structural component that carries the load above an opening.

(b) State two functions of an arch ring.

The arch ring transfers loads from above to the abutments or supporting piers. It also provides a stable and durable finish to the arch, ensuring structural integrity and aesthetic appeal.

6. (a) Differentiate between shallow and deep foundations.

Shallow foundations are constructed near the ground surface and transfer loads directly to the upper soil layers. They are suitable for structures with moderate loads on strong soils. Deep foundations, such as piles or caissons, transfer loads to deeper, more stable soil or rock layers and are used when surface soils are weak or compressible.

(b) Suggest two cases where deep foundations are more appropriate.

Deep foundations are appropriate for high-rise buildings where heavy loads must reach stable strata. They are also suitable for bridges or industrial structures built on soft, loose, or waterlogged soils, where shallow foundations would be insufficient.

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