THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN TECHNICAL EDUCATION EXAMINATION.

784 **BRICKWORK AND MASONRY**

(SUPPLEMENTARY)

Time : 3 Hours **ANSWERS** **Year : 2000**

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).

1. (a) Define the term "bonding in brickwork".

Bonding in brickwork is the arrangement of bricks in a wall in such a way that they are tied together, ensuring both strength and stability. It helps distribute loads evenly across the structure and prevents vertical joints from running continuously through multiple courses, which would weaken the wall.

(b) With sketches, explain the construction of an English bond in a one-brick thick wall.

An English bond is formed by alternating courses of headers and stretchers. In one course, bricks are laid lengthwise (stretchers) along the face of the wall, and in the next course, bricks are laid widthwise (headers). This arrangement ties the wall together strongly, as the headers cover the vertical joints of the stretchers below, producing a strong and stable bond. In a one-brick thick wall, the pattern continues consistently, ensuring the alignment of vertical joints is broken in each successive course.

2. (a) What is a lintel?

A lintel is a horizontal structural element placed across openings such as doors, windows, or passages to support the load of the wall above the opening. It distributes the weight to the side walls, preventing collapse of the opening.

(b) Mention three types of lintels used in masonry construction.

Timber lintels are made of strong wood and are commonly used in small residential buildings. Stone lintels are slabs of stone laid across openings, traditionally used in thick stone walls. Reinforced concrete lintels are made from concrete reinforced with steel bars and are widely used due to their strength, durability, and versatility.

(c) Describe the construction process of a reinforced concrete lintel over a door opening.

The process begins with erecting temporary supports or formwork on both sides of the door opening. Reinforcement bars are placed according to design, typically running lengthwise with stirrups to hold them in position. Concrete is then poured into the formwork, covering the reinforcement completely. After curing for the required period, usually at least 7 days, the formwork is removed and the lintel becomes capable of carrying the wall load above the opening.

3. (a) Define the term “expansion joint”.

An expansion joint is a deliberate gap provided in masonry or concrete structures to allow for expansion and contraction due to temperature changes, moisture, or other movements. It prevents cracks and structural damage.

(b) State three reasons why expansion joints are necessary in masonry structures.

First, they prevent cracking caused by thermal expansion and contraction of materials. Second, they help accommodate shrinkage in newly constructed masonry as it dries. Third, they allow for movement in large buildings caused by ground settlement or vibration, maintaining structural stability.

4. (a) Mention four causes of cracks in masonry walls.

Cracks can be caused by differential settlement of the foundation. They can also result from thermal expansion and contraction of materials. Poor construction practices such as inadequate bonding or weak mortar are another cause. Finally, cracks may arise from overloading or vibrations from nearby activities.

(b) Explain how each cause can be minimized or prevented on site.

Foundation settlement can be minimized by ensuring proper soil testing and designing foundations according to soil conditions. Thermal expansion and contraction can be controlled by providing expansion joints at appropriate intervals. Poor construction practices are avoided by ensuring skilled labor, proper bonding patterns, and correct mortar mix proportions. Overloading can be minimized by designing walls to bear only their intended loads and avoiding excessive superimposed weights.

(c) Suggest two methods of repairing cracks in brick walls.

One method is raking out the crack and filling it with fresh mortar or epoxy resin, which restores the bond between bricks. Another method is stitching, which involves embedding metal bars across the crack and covering them with mortar to hold the wall together firmly.

5. (a) What is pointing in masonry work?

Pointing is the process of finishing the external face of mortar joints in masonry construction by raking out old mortar and refilling with new mortar to protect the wall and improve appearance. It provides durability by preventing water penetration.

(b) Mention three types of pointing used in brickwork.

Flush pointing is where mortar is finished flush with the brick surface. Recessed pointing is where mortar is pressed back slightly from the brick face, giving a shadow effect. Weathered pointing slopes outward to shed rainwater, offering better protection against moisture.

6. (a) Differentiate between dry stone masonry and coursed stone masonry.

Dry stone masonry is the construction of walls using stones without any mortar, relying solely on the careful placing and interlocking of stones. Coursed stone masonry, on the other hand, is built with stones laid in uniform horizontal layers (courses) with mortar joints binding them together.

(i) State two advantages of dry stone masonry.

Dry stone masonry is economical because it does not require cement or mortar. It is also durable and allows natural drainage of water through the gaps, reducing water pressure behind walls.

(ii) Give two examples where coursed stone masonry is more appropriate.

Coursed stone masonry is more suitable in the construction of residential buildings where appearance and strength are important. It is also appropriate in boundary walls and retaining walls where a neat and regular finish is required.