THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

074 CARPENTRY AND JOINERY

(For Both School and Private Candidates)

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

Instructions

1. This paper consists of seven questions.

2. Attempt question number 1 and any other four questions.

1. (a) What is a joint?

A joint is a connection between two or more pieces of wood, metal, or other materials, used in construction, furniture making, and engineering to create a strong and stable structure. In woodworking, joints are essential in assembling components to form a durable product. The choice of joint depends on the strength required, the direction of forces acting on the structure, and the method of fixing.

(b) By means of sketches show how a mortise and tenon joint is reinforced by pinning.

A mortise and tenon joint consists of a rectangular hole (mortise) cut into one piece of wood and a corresponding projection (tenon) on another piece that fits into the mortise. This joint is reinforced by inserting a pin through both pieces to secure them. The pin prevents the tenon from slipping out and increases the joint's resistance to pulling forces.

(c) Name the methods used to plane the end grains of timber.

- End grain shooting: This involves using a hand plane with a shooting board to create a smooth finish on the end grain.
- Chamfer planing: This method involves slightly beveling the edges of the end grain to reduce splintering.
- Sanding: The end grain can also be sanded with fine-grit sandpaper to achieve a smooth surface.
- Rasping: A rasp or file can be used to level and smooth the end grain before final finishing.

(d) Make a sketch of a square haunched mortise and tenon joint and show the relations between:

(i) The length of haunch and the tenon thickness
(ii) The depth of haunch and the width of tenon
(iii) The thickness of tenon and the thickness of the workpiece

A square haunched mortise and tenon joint includes a small extension, called a haunch, at the tenon's end. This haunch increases the joint's stability by providing extra resistance to twisting forces. The length of the haunch is usually proportional to the tenon thickness, while the depth of the haunch is typically one-third of the tenon width. The thickness of the tenon is about one-third of the thickness of the workpiece to ensure a strong fit.

2. (a) What is a centre as used in building construction?

A centre in building construction is a temporary framework or support used to shape arches, vaults, or other curved structures while they are being built. It holds the structure in place until the masonry or concrete sets and becomes self-supporting.

(b) Name three areas in a building which used centring.

- Arches: A temporary wooden or metal frame supports the arch during construction until the keystone is in place.
- Domes: Centring is used to form the circular shape of domes in masonry and concrete structures.
- Bridges: When constructing stone or concrete bridges, centring holds the structure in place until the materials harden.

(c) Mention four types of centres.

- Timber centring: Made of wooden frameworks used for temporary support.
- Steel centring: Used in large-scale constructions where high strength is required.
- Brick centring: Sometimes used in traditional construction to support arches.
- Folding centring: A reusable type of centring that can be adjusted and repositioned for multiple uses.

(d) Make a sketch of a Gothic arch centre and show:

(i) The upper tie
(ii) Rib
(iii) Piers
(iv) Lower tie
(v) Bracing

A Gothic arch has a pointed top, providing structural stability and aesthetic appeal. The upper tie supports the ribs, which form the arch shape. The piers are the vertical supports that transfer weight to the ground. The lower tie holds the arch in place, and bracing prevents lateral movement.

3. (a) Define the term "roof coverings".

Roof coverings are the materials used to protect the roof structure from environmental elements such as rain, sun, and wind. They provide insulation, weatherproofing, and durability to the building.

(b) Name five types of roof coverings.

- Asphalt shingles: Made from a combination of asphalt and fiberglass, commonly used in residential roofing.
- Metal roofing: Made from steel, aluminum, or copper, known for its durability and resistance to weather.
- Clay tiles: Used in hot climates, providing good insulation and aesthetic appeal.
- Thatched roofing: Made from dry vegetation such as straw, reeds, or palm leaves, often used in traditional buildings.
- Concrete roofing: Made from precast concrete slabs or tiles, providing strength and fire resistance.

(c) Give five roof covering requirements.

- Weather resistance: The covering must protect the building from rain, wind, and sunlight.

- Durability: The material should last long and withstand harsh weather conditions.
- Lightweight: Heavy roofing materials require a stronger support structure.
- Fire resistance: Roofing should provide protection against fire hazards.
- Aesthetic appeal: The covering should complement the building's design and style.

(d) A gable roof's sloping edge is 4 m long and 10 m wide. Calculate the number of C.I.S. required to cover the roof. (Take length of sheets to be 2.4 m and width of 1 m).

To calculate the number of sheets:

- Determine the total area of the roof:
  - Roof area = length × width
  - Roof area = 4 m × 10 m = 40 square meters

- Determine the area covered by each sheet:
  - Each sheet covers 2.4 m × 1 m = 2.4 square meters

- Number of sheets required:
  - Total sheets = total area ÷ area per sheet
  - Total sheets = 40 ÷ 2.4
  - Total sheets = 16.67 (rounded up to 17 sheets)

4. Define the term "conversion" as used in building construction.

Conversion in building construction refers to the process of transforming raw timber logs into usable wooden planks or beams. This process includes cutting, seasoning, and treating timber to improve its durability and strength for use in construction projects.

(b) Name three methods of converting timber.

- Plain sawing: Cutting logs into parallel planks with minimal waste.
- Quarter sawing: Cutting logs into quarters before further slicing, providing stronger and more stable planks.
- Rift sawing: Cutting logs at a specific angle to achieve straight grain patterns, often used in flooring and furniture making.

(c) Write short notes on the following:

- Balks: Large, squared timber beams used in heavy construction.
- Planks: Wooden boards that are cut and smoothed for use in flooring, walls, and furniture.
- Flitches: A section of a log that includes the natural edge, used for veneering and decorative purposes.
- Battens: Thin wooden strips used for supporting roofing sheets, tiles, or wall cladding.
- Scantlings: Small timber sections used for framing and structural support.

(d) What will happen if the conversion of fallen logs is delayed?

If fallen logs are not converted in time, they may deteriorate due to fungal attacks, insect infestation, and exposure to moisture, leading to decay. Prolonged exposure can cause cracks, warping, and discoloration, reducing the timber's usability and economic value. Proper storage and quick conversion ensure high-quality timber for construction and furniture making.

5. (a) Define the term "floor".

A floor is the lower surface of a room or building that provides a stable and usable walking area. It is designed to support loads, resist wear, and provide insulation. Floors can be made from different materials such as wood, concrete, tiles, and metal, depending on their intended use and structural requirements.

(b) Mention all classes of timber floors.

Timber floors are categorized based on their construction and design. The main classes include:

- Suspended timber floors: These floors are raised above the ground on joists, allowing ventilation beneath to prevent moisture damage.
- Solid timber floors: These are made from thick, durable wooden planks fixed directly onto joists or concrete.
- Floating timber floors: These are not nailed or glued to the subfloor but instead rest on an underlay, allowing expansion and contraction due to temperature changes.
- Laminated timber floors: These consist of layers of wood pressed together with a durable top layer for added strength and aesthetics.
- Engineered timber floors: These are made from multiple layers of wood veneer glued together, providing stability and resistance to warping.

(c) What causes the difference in floor classes mentioned in (b) above?

The differences in timber floor classes arise due to factors such as:

- The method of installation: Some floors require direct fixing, while others use a floating technique.
- The level of moisture resistance needed: Suspended floors allow ventilation, whereas solid floors may absorb moisture if not treated.
- The durability and load-bearing capacity: Engineered and laminated floors are designed for strength, while floating floors are more flexible.
- The cost and availability of materials: Solid timber floors are more expensive compared to laminated or engineered floors.

(d) What governs the selection of timber floor joist sizes?

The selection of timber floor joist sizes depends on several factors, including:

- The span of the floor: Longer spans require thicker and stronger joists to prevent sagging.
- The load requirements: Floors expected to bear heavy furniture or machinery require larger joists for stability.
- The type of timber used: Hardwoods have higher strength compared to softwoods, affecting joist sizing.
- The spacing of joists: Closer spacing allows for thinner joists, whereas wider spacing requires thicker joists.

(e) What do you understand by the term "herringbone strutting"?

Herringbone strutting is a method used to reinforce timber floor joists by inserting diagonal braces between them in a herringbone pattern. This technique helps distribute loads evenly, prevents joist movement, and increases the floor's stability. It is commonly used in wooden floors to reduce vibration and improve strength.

6. (a) What is a partition?

A partition is a non-load-bearing wall that divides a space into separate rooms or sections within a building. Partitions are used to enhance privacy, control noise, and organize interior layouts. They can be made from timber, bricks, glass, or metal, depending on the design and functional requirements of the space.

(b) Mention two types of timber partitions.

- Stud partition: A lightweight frame made of timber, covered with plywood, plasterboard, or fiberboard. This type is common in homes and offices due to its ease of installation and flexibility.
- Lath and plaster partition: A traditional method where thin wooden laths are nailed to a timber frame and covered with plaster. This provides good insulation and fire resistance.

(c) Make a sketch of a stud timber partition and show:

(i) Studs – The vertical wooden members that form the main framework of the partition.
(ii) Staggered nogging pieces – Horizontal blocks placed between studs to increase rigidity.
(iii) Top rail – The horizontal timber at the top of the partition that connects the studs.
(iv) Plasterboard – The sheet material fixed onto the framework to form the wall surface.

(d) By means of sketches, show two methods of joining nogging pieces to studs.

Nogging pieces can be joined to studs using:

- Nailing: The simplest method where the nogging is nailed between the studs.

- Housing joint: A notch is cut into the stud, and the nogging piece is fitted into it before securing with nails or screws.

(e) Show or name the area where the tusk tenon joint is used.

The tusk tenon joint is commonly used in timber framing, especially in floor and roof construction. It is used to secure beams and joists in traditional wooden structures, providing a strong and durable connection.

7. (a) What are wood working machines?

Woodworking machines are mechanical tools designed to cut, shape, and join wood efficiently. They increase precision, speed, and quality in carpentry and furniture making. These machines range from simple hand-operated tools to advanced automated systems used in mass production.

(b) Name four common wood working machines.

- Table saw: A circular saw mounted on a table for cutting large wooden boards.
- Planer: A machine used to smooth and level wooden surfaces to the required thickness.
- Lathe: A rotating machine used to shape wood into cylindrical forms, such as table legs and bowls.
- Band saw: A continuous blade saw used for cutting curves and irregular shapes in wood.

(c) List four operations done on the circular saw machine.

- Ripping: Cutting wood along the grain to create narrower pieces.
- Cross-cutting: Cutting wood across the grain to achieve the desired length.
- Bevel cutting: Cutting wood at an angle to create sloped edges.
- Grooving: Cutting channels or grooves into the wood for joint fitting.

(d) Name all stages of sharpening a circular saw blade.

Sharpening a circular saw blade involves several steps to restore its cutting efficiency:

1. Cleaning the blade: Removing dirt, resin, and sawdust to expose the cutting edges clearly.
2. Inspecting for damage: Checking for worn-out or broken teeth that may need replacement.
3. Filing the teeth: Using a file or sharpening tool to restore the sharp edge of each tooth.
4. Setting the teeth: Adjusting the tooth angles to ensure even cutting performance.
5. Polishing and lubricating: Applying a protective coating to reduce friction and prevent rusting.