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: 2004**

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. Choose the correct answer from among the given alternatives and write its letter beside the item number.

(i) The temporary braces used on door frames to maintain a tested squareness is
A. later left to be part member of a frame
B. removed when the frame is fixed in position on the site
C. removed and replaced by introducing the lags
D. removed when the bottom member of a frame is fixed
E. removed when the shutter is fixed

Temporary braces are used to hold the door frame in the correct position until it is securely fixed. Once the frame is in place and stable, they are removed.

Correct answer: B

(ii) The beams introduced to complete a rectangular framing of a truss for a pitch roof
A. prevent the curved nail in eave which can cause a house to collapse
B. prevent the air compression
C. are a normal formula of making frames
D. is there to increase the king post
E. is made to receive the ceiling board

In a pitched roof, the beam is introduced to provide structural stability and serve as a support for ceiling boards.

Correct answer: E

(iii) The means of avoiding a nail from splitting the wood is by
A. drying wood properly
B. working with green timber
C. sharpening the end of the nail
D. blunting the end of the nail
E. wetting the end of the nail before driving into wood

Blunting the tip of the nail helps prevent wood from splitting by reducing the force exerted in a single direction when driven into the wood.

Correct answer: D

(iv) Bow, clip, spring, and twist are forms of
A. joints
B. sample
C. timber
D. timber connector

E. screw

These terms describe different types of deformations or defects that can occur in timber due to moisture loss and improper seasoning.

Correct answer: C

(v) The formula for determining the pitch of a roof is
A. ratio of span to the rise
B. ratio of span to the rafter
C. ratio of rise to span
D. the product of the pitch and the span
E. the product of span and rise

Pitch is calculated as the ratio of the rise (vertical height) to the span (horizontal distance).

Correct answer: C

(vi) Ironmongery that allows movement includes
A. bolt, screws, suffolk and butt hinge
B. spring hinge, piano and parliament hinge
C. pound-car, succession and crim pin
D. hooks, flags, tacks and wiggle
E. bolts, spring hinge, pound-end and tucker

Spring hinges, piano hinges, and parliament hinges are types of ironmongery that allow movement by enabling rotation or pivoting.

Correct answer: B

(vii) Safety regulations govern the
A. workshop only
B. workshops and hand tools
C. workshops, hand tools and clothing
D. hand tools and clothing only
E. working bench

Safety regulations cover all aspects of a workshop, including hand tools, protective clothing, and equipment usage to ensure a safe working environment.

Correct answer: C

(viii) Cohesion and adhesion are the major factors which determine the
A. weakness of the glue
B. strength of the glue
C. tightness of two timbers together
D. glistening of the varnish
E. water content of the timber

The strength of the glue depends on cohesion (internal bonding of glue molecules) and adhesion (how well it sticks to surfaces).

Correct answer: B

(ix) Which of the following is a possible situation to promote fungus growth?
A. Damp and noisy
B. Flat and windy
C. Damp and unventilated
D. Dark and unventilated
E. Rainy and ventilated

Fungus grows best in damp and unventilated conditions where moisture accumulates and air circulation is poor.

Correct answer: C

(x) The best seasoning method of timber is the
A. trough and through method
B. slash method
C. tangential turning
D. quarter sawn method
E. combined quarter and the slash method

The combined quarter and slash method is the best as it balances efficiency and quality, reducing warping and defects while allowing faster drying.
Correct answer: E

2. Match the responses in List B with the phrases in List A by writing the letter of the correct response beside the item number.

List A

(i) An outward direction weathered beyond the face of the building thus throwing water clear of the face
(ii) A material adhesive used for sand warding

(iii) A nail made to hold fencing wire
(iv) They are clinging together molecules of different substances
(v) The hinges better for gates and public building doors
(vi) A structure temporary supporting material and workers above ground
(vii) Common joint for flooring
(viii) Device of galvanized steel for joining built-up roof trusses
(ix) Placing of glass window and doors
(x) An individual frame into which glass is set

List B

A. Connectors
B. U-bolt
C. Sash
D. Siding and paneling
E. Widening
F. Glazing
G. Coupling
H. Sawing
I. Scaffolds
J. Cohesion
K. Tee hinges
L. Hooks and hinges
M. Staples
N. Barbed dovetail
O. Sill
P. Stud
Q. Game
R. Flint
S. Nail wire

Correct Answers

(i) O
(ii) D
(iii) S
(iv) J
(v) K
(vi) I
(vii) N
(viii) A
(ix) F
(x) C

3. Joining, fixing devices, and materials to provide structural efficiency fall into three groups. Name the three groups.

Joining, fixing devices, and materials in construction and woodworking are classified based on their function and method of application.

The first group is mechanical fasteners, which include nails, screws, bolts, and rivets. These devices physically hold materials together by friction or penetration, making them essential in woodworking, metalworking, and structural framing.

The second group is adhesive bonding, which involves using substances like glue, epoxy, and resin to join materials at a molecular level. This method provides a smooth finish, distributes load evenly, and is often used in furniture making and composite material assembly.

The third group is interlocking joinery, which uses specially designed cuts and shapes to fit two or more materials together without the need for additional fasteners. Examples include dovetail joints, mortise and tenon joints, and tongue and groove joints. These joints provide high strength and are commonly used in cabinetry and structural woodworking.

4. Show four areas of work where the wedges are important devices.

Wedges play a crucial role in various fields due to their ability to provide stability, adjustability, and secure fastening.

The first area where wedges are essential is in door and window frame installation. Wedges are used to hold the frame in the correct position during installation, ensuring it remains level and square before securing it permanently.

The second area is in machinery alignment and leveling. Wedges are placed beneath heavy machinery to adjust and stabilize them on uneven surfaces, preventing vibration and misalignment.

The third area where wedges are significant is in securing and tightening wooden joints in carpentry. Wedges are inserted into joints, such as mortise and tenon joints, to strengthen the connection and prevent loosening over time.

The fourth area is in stone masonry and bricklaying, where wedges are used to split and shape stones or bricks, allowing for precise fitting in construction.

5. Name three types of mortising machines.

Mortising machines are used to cut square or rectangular holes in wood, mainly for creating mortise and tenon joints.

The first type is the chain mortiser, which operates using a small chainsaw-like cutting mechanism to remove wood in a precise manner. It is commonly used in heavy timber framing and large woodworking projects.

The second type is the hollow chisel mortiser, which uses a drill bit inside a square chisel to remove material while forming clean, square edges. This machine is widely used in furniture making and cabinetry.

The third type is the slot mortiser, which operates with a rotating spindle and moving workpiece to cut elongated slots in wood. It is often used in mass production settings where speed and accuracy are required.

6. Explain the following terms as used in woodwork.

(a) Dowelling

Dowelling is a woodworking technique that involves inserting cylindrical wooden or metal rods, known as dowels, into pre-drilled holes to strengthen a joint. This method is commonly used in furniture assembly and cabinet making, where screws or nails may not provide the desired aesthetic or structural integrity. Dowelling creates a strong, hidden joint that can withstand tension and compression forces.

(b) Trenching

Trenching in woodworking refers to cutting a groove or slot into a piece of wood to accommodate another piece, typically in joint construction. This technique is used in housing joints, dado joints, and lap joints to ensure a snug fit and increased surface area for adhesion. Trenching is essential in shelving, flooring, and furniture construction to provide stability and support.

7. Name three methods used for the construction of timber floors.

Timber flooring is installed using various construction methods to ensure durability and stability.

The first method is suspended timber flooring, where timber joists are raised above the ground, supported by walls or beams. This method is commonly used in traditional houses and allows for ventilation beneath the floor, preventing dampness and decay.

The second method is solid timber flooring, where thick wooden planks are directly fixed onto joists or concrete subfloors. This method provides a strong and long-lasting floor surface, commonly seen in high-end residential and commercial buildings.

The third method is floating timber flooring, where the floorboards are not nailed or glued but instead interlock and rest on an underlay. This method is popular for quick installations and allows for expansion and contraction of the wood due to temperature changes.

8. State four major steps, by sequence, used in sharpening a dull saw.

Sharpening a saw restores its cutting efficiency and prolongs its lifespan. The process follows four major steps:

The first step is cleaning the saw blade to remove dirt, rust, and residue that may affect sharpening. This is done using a wire brush, sandpaper, or solvent to ensure the teeth are clearly visible.

The second step is filing the teeth using a triangular file, which sharpens each tooth to restore its cutting edge. The file is moved in a precise motion to maintain uniformity across the blade.

The third step is setting the teeth, which involves slightly bending alternating teeth outward to create clearance in the kerf. This ensures that the saw does not bind while cutting through wood.

The fourth step is polishing and lubricating the blade to remove rough edges and protect it from corrosion. A light coat of oil or wax is applied to enhance smooth cutting and prevent rust formation.

9. Explain briefly two types of timber partitions.

Timber partitions are non-load-bearing walls used to divide interior spaces.

The first type is the stud partition, which consists of a lightweight timber frame covered with plasterboard, plywood, or fiberboard. This partition is widely used in residential and office spaces as it is easy to install, soundproof, and allows for electrical wiring and insulation.

The second type is the lath and plaster partition, which consists of thin wooden laths nailed to a timber frame and covered with layers of plaster. This traditional partition is durable, fire-resistant, and provides good sound insulation but is less common in modern construction due to labor-intensive installation.

10. Name four methods used to fix a door frame.

A door frame must be securely fixed to ensure proper door operation and durability.

The first method is using screws and wall plugs, where heavy-duty screws are driven into pre-drilled holes in the surrounding wall, secured with plastic or metal plugs to prevent loosening.

The second method is nailing with wooden wedges, where tapered wooden blocks are used to tightly fit the frame into position before fastening it with nails.

The third method is anchoring with metal brackets, where L-shaped or U-shaped brackets are screwed into both the frame and the wall for additional strength.

The fourth method is mortising into the wall structure, where grooves or recesses are cut into the wall to fit the door frame snugly, providing a flush and secure installation.

12. (a) State two types of sleeves.

Sleeves are cylindrical or hollow components used in construction and woodworking to provide protection, alignment, or support for various materials and fasteners.

The first type is expansion sleeves, which are used in construction to allow for the expansion and contraction of materials due to temperature changes or structural movement. These are commonly found in metalwork, piping systems, and concrete construction to prevent cracking and structural failure.

The second type is conduit sleeves, which are primarily used in electrical and plumbing installations. These sleeves provide a protective channel for electrical wires or pipes passing through walls, floors, or concrete structures, preventing damage and ensuring proper alignment.

(b) Explain briefly the two types in 12(a).

Expansion sleeves function by creating a controlled space within a structure, allowing materials such as concrete, wood, or metal to expand and contract without causing stress or damage. This is essential in bridges, large buildings, and piping systems to accommodate environmental changes and prevent fractures.

Conduit sleeves, on the other hand, act as a protective casing for wires, pipes, or cables, ensuring that they are not exposed to mechanical damage, moisture, or environmental hazards. These sleeves are often made from plastic, rubber, or metal and are widely used in electrical wiring, plumbing, and HVAC systems to enhance safety and durability.

11. What is the difference between "lock" and "night latch lock"?

A lock is a mechanical or electronic fastening device that secures doors, cabinets, or other enclosures, allowing access only with a key, code, or authorized mechanism. Locks come in various types, such as deadbolts, padlocks, and combination locks, each designed for specific security needs. They can be operated manually or electronically, depending on their design and application.

A night latch lock, on the other hand, is a specific type of lock designed for doors that automatically locks when the door is closed. It is commonly mounted on the inside surface of a door and features a latch that is spring-loaded, ensuring the door stays locked unless manually unlocked from inside or with a key from outside. Unlike traditional locks that require turning a key or bolt, a night latch provides quick locking functionality, often used for residential entry doors for additional security.

The key difference between the two is that a standard lock requires deliberate locking, while a night latch lock engages automatically when the door is closed. This makes the night latch ideal for security purposes where immediate locking is necessary, but it can also pose a risk of accidental lockouts if not used carefully.

13. Study the diagram in figure 1 and answer the following questions.

(a) Name the type of door in figure 1.

The door shown in figure 1 is a ledge and brace door. This type of door consists of horizontal ledges, vertical planks, and diagonal braces to provide structural strength and prevent warping. It is commonly used in barns, sheds, and traditional wooden constructions.

(b) Give the names of the members A, B, and C.

- A: Ledge – The horizontal timber pieces that provide support and hold the vertical boards together.
- B: Brace – The diagonal timber that prevents the door from sagging and maintains its shape.
- C: Plank – The vertical boards that form the face of the door and provide the main surface.

(c) Name the suitable ironmongery available for fixing or hanging the door.

Ironmongery refers to the metal fittings used in door installations. Suitable ironmongery for fixing or hanging this door includes:

- Tee hinges – Large strap hinges designed for ledge and brace doors to provide strong support.
- Tower bolts – Used to secure the door from inside for additional security.
- Rim lock – A surface-mounted lock that provides locking functionality.
- Door handles or pull handles – Used for ease of operation.
- Latches – Simple mechanisms that keep the door closed without the need for a key.

(d) If the door is made of timber 230 x 25 mm, calculate the selling price of the door given the following:

- Price per running meter = 4,200/=
- 50 mm nails (4 kg) at 1,100/= per kilogram
- 3 ½ x 1 ¼ inch head screws (1 gross) at 1,500/= per gross

(Assume calculations are based on a mass production system).

1. Calculate the length of timber required:
   - Total width of the door: 850 mm = 0.85 m
   - Total height of the door: 2,064 mm = 2.064 m
   - Number of vertical planks = Width of door / Width of timber
     = 0.85 m / 0.23 m
     = 4 planks (approximate)
   - Total running meters for planks = 4 x 2.064 m
     = 8.256 m

2. Calculate the cost of timber:
   - Timber cost = 8.256 m × 4,200/=
   = 34,675.2/=

3. Calculate the cost of nails:
- 4 kg × 1,100/=
= 4,400/=

4. Calculate the cost of screws:
- 1 gross = 1,500/=

5. Total cost of materials:
= 34,675.2 + 4,400 + 1,500
= 40,575.2/=

14. (a) Define the term defect in timber.

A defect in timber refers to any irregularity or imperfection that affects its strength, appearance, or usability. These defects can occur naturally due to growth conditions or result from improper seasoning, storage, or handling. Examples include knots, warping, cracks, and insect damage.

(b) Timber defects are classified in two groups. Name them.

Timber defects are classified into:

- Natural defects – These defects occur during the growth of the tree, such as knots, shakes, and twisted grains.
- Artificial defects – These defects result from improper handling, drying, or processing, such as warping, cupping, and splitting.

(c) Write down four defects during tree growth.

Defects that occur while the tree is still growing include:

- Knots – Formed where branches were attached to the trunk, affecting structural integrity.
- Shakes – Cracks or splits in the wood grain caused by stress during growth.
- Reaction wood – Wood that forms abnormally in leaning trees, making it weaker.
- Gum pockets – Resin accumulation in softwoods, weakening the timber structure.

(d) By means of a sketch, show the difference between a live knot and a dead knot.

A live knot is a knot where the surrounding wood fibers are firmly attached to the knot, meaning it retains structural strength. A dead knot is a knot that has detached from the surrounding wood, creating a weak point that can fall out, leaving a hole in the timber.

15(a) What does the term timbering in trenches mean?

Timbering in trenches refers to the use of wooden supports to prevent soil collapse while excavating trenches. It involves placing timber planks along the walls of the trench, supported by struts and braces, ensuring safety for workers and stability of the excavation site.

(b) Write down three causes of timbering.

The need for timbering arises due to:

- Loose soil conditions – When the soil is unstable and prone to collapse.
- Deep excavations – When trenches are deep and require reinforcement to prevent cave-ins.
- Waterlogged ground – When groundwater weakens soil strength, increasing the risk of collapse.

(c) State three regulations used in building construction.

Regulations in building construction ensure safety, durability, and compliance with legal standards. Key regulations include:
- Structural stability requirements – Ensuring buildings can withstand loads and external forces.
- Fire safety regulations – Mandating fire-resistant materials and emergency exits in construction.
- Environmental impact rules – Controlling waste disposal, energy efficiency, and sustainability practices.

(d) Sketch a simple method of protecting an open trench.
An open trench can be protected using trench shoring, which involves placing horizontal planks supported by vertical posts to prevent the walls from collapsing. Another method is trench shielding, where prefabricated metal or wooden boxes are placed inside the trench to protect workers from falling soil.