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: 2006**

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. (i) Double glazing means:

A. two glasses fitted to casement as a single unit
B. two casement hinged together and fitted into a frame as a single unit
C. double glass glazed as a single unit fitted to sashes
D. double sashes fitted to a frame as a single unit
E. two different glass colours act as single unit fitted to a casement

Correct answer: C. double glass glazed as a single unit fitted to sashes

Reason: Double glazing refers to the use of two panes of glass separated by a layer of air or inert gas within a single sealed unit. This improves insulation, reduces noise, and enhances energy efficiency in buildings.

(ii) Safety governs the:

A. clothing and hand tools only
B. workshop working benches only
C. workshop, machines, hand tools and personal protective clothing
D. workshop and hand tools only
E. hand tools and machines only

Correct answer: C. workshop, machines, hand tools and personal protective clothing

Reason: Safety regulations in a workshop cover all aspects, including personal protective equipment (PPE), machine operation, tool handling, and maintaining a safe working environment to prevent accidents.

(iii) It is important to keep the oil stone of a wooden box because:

A. it simplifies the work of sharpening cutters
B. the wooden box is cheap
C. it retains the oil poured onto it
D. it breaks easily when dropped
E. it prolongs the lifespan of the stone

Correct answer: C. it retains the oil poured onto it

Reason: Oil stones require oil to facilitate the sharpening process by reducing friction and preventing clogging with metal particles. A wooden box helps retain this oil, keeping the stone effective.

(iv) In woodworking, the internal built-in fitting means all:

A. permanent fixtures in the building
B. movable fixtures in the building

C. wall partitions
D. toilet fixtures
E. bathroom fixtures

Correct answer: A. permanent fixtures in the building

Reason: Internal built-in fittings are non-removable components integrated into the structure, such as cabinets, cupboards, and shelving, forming part of the building's permanent design.

(v) A burnisher is an abrading tool for sharpening:

A. scrapers
B. chisels
C. nail punches
D. cutting knife
E. saws

Correct answer: A. scrapers

Reason: A burnisher is used to refine and sharpen scrapers by polishing and creating a fine edge, enhancing their performance in smoothing surfaces.

(vi) Is one of the basic factors for formwork structure:

A. to protect operatives while working in trenches
B. to decorate the trenches
C. to allow stones and soil fall in trenches
D. to remove soil from the trenches
E. to dismantle sheeting from the trenches

Correct answer: A. to protect operatives while working in trenches

Reason: Formwork is designed to provide temporary support during construction, ensuring structural stability and protecting workers from potential collapses or shifting soil.

(vii) Is a wood structure used as temporary support for an arch during construction:

A. centring
B. segment
C. lintel
D. wedge
E. scaffold

Correct answer: A. centring

Reason: Centring is a temporary wooden framework that supports an arch or vault during construction until the structure is self-supporting.

(viii) How are the grains in panels arranged in the frame?

A. They are arranged to match
B. They are arranged to cross
C. Randomly arranged
D. Diagonally arranged
E. Staggered arranged

Correct answer: A. They are arranged to match

Reason: In panel construction, grains are typically arranged to match for aesthetic appeal and to maintain uniformity, ensuring a stable and visually consistent surface.

(ix) Wall, screen, and balustrade are all:

A. parts made stairs
B. type of stairs
C. partition walls
D. steps of staircases
E. stair guider

Correct answer: C. partition walls

Reason: These components function as dividing elements in buildings, providing separation, privacy, and structural support within an interior space.

(x) A structure liable to collapse can temporarily be propped using:

A. retaining walls
B. scaffold
C. shoring
D. fender wall
E. underpinning

Correct answer: C. shoring

Reason: Shoring is a temporary structural support used to stabilize buildings, trenches, or walls that are at risk of collapse, ensuring safety during construction or repairs.

Matching Items in List A with List B

i. The simplest joint in woodwork P. Butt joint
ii. A vertical member of a structure used to carry the load and transmit them to the foundation T. Column
iii. The defect that begins at the heart of the log due to over-maturity of the tree M. Heart shakes
iv. Driving in and pulling out nails S. Claw hammer
v. Seat of a rafter I. Collar tie
vi. A wooden piece provided to receive the trimmed joists H. Ring beam
vii. An alternative method of cramping boards in timber floor construction G. Pantiles
viii. A roofing material whose side overlapping is like that of corrugated iron sheets J. Birds mouth
ix. A finish which provides changes of color to the worked surface F. Stain
x. An iron mongery used for fixing machinery in workshops R. Horning

3. The wet weight of timber piece was 850 g before drying. After drying, the piece was re-weighed and found to be 750 g.

a. Calculate the percentage moisture content.

Moisture content (MC) is calculated using the formula:
MC = [(Wet weight - Dry weight) / Dry weight] x 100
MC = [(850 - 750) / 750] x 100
MC = (100 / 750) x 100
MC = 13.33%

b. From the results in (a) above, can the timber be suitable for furniture making?

Yes, the timber can be used for furniture making since the moisture content is within an acceptable range. Most furniture timber should have a moisture content between 6% and 15% to prevent shrinkage and warping.

4. Distinguish between putlog and independent scaffolds.

Putlog scaffolds are those that have one end of the scaffold secured to the building, with the other side supported by poles. They are commonly used for bricklaying.

Independent scaffolds are self-supporting and consist of two rows of vertical standards connected with horizontal ledgers, making them suitable for various construction activities.

5. Explain the difference between an emery cloth and an emery wheel.

Emery cloth is a flexible abrasive material made by bonding emery particles onto a cloth backing, used for hand sanding and polishing metal and wood surfaces.

Emery wheel is a rigid grinding wheel made of emery bonded with resins or other materials, used for sharpening tools and metalwork grinding.

6. Give a brief description of cutting list as used in carpentry and joinery.

A cutting list is a document detailing the required dimensions and quantities of timber pieces needed for a woodworking project. It includes information such as length, width, thickness, type of wood, and special instructions to minimize wastage.

7. What is veneering?

Veneering is the process of applying a thin layer of fine-quality wood (veneer) onto a core material, such as plywood or MDF, to enhance its appearance. It provides an attractive finish while using less expensive base materials.

8. a. Define the term seasoning.

Seasoning is the process of reducing the moisture content of timber to make it more stable and durable, preventing warping, shrinkage, and fungal attacks.

b. Mention three methods of timber seasoning.

i. Air seasoning – Timber is stacked in a well-ventilated area to dry naturally.
ii. Kiln seasoning – Timber is dried in a controlled chamber using heat and humidity control.
iii. Chemical seasoning – Chemicals are applied to accelerate moisture removal.

9. Explain the following

a. Winding strips are strips used in staircases to align and support winding steps that turn at an angle.

b. Trenching is the process of cutting a recess or groove into timber to allow interlocking joints, commonly used in construction.

10. a. What does the term "ceiling trimming" mean?

Ceiling trimming refers to the decorative moldings or finishing materials used at the junction between walls and ceilings to enhance aesthetics and hide gaps.

b. Why is it necessary to provide night lighting to pavement scaffolds?

Night lighting ensures safety by making scaffolding visible to workers and pedestrians, preventing accidents and unauthorized access.

11. a. What do staggered nails or screws joint mean?

Staggered nailing refers to placing nails or screws in a zigzag pattern rather than a straight line to improve holding strength and reduce splitting in wood joints.

b. Explain the uses of a claw bar.

A claw bar is used for removing nails, prying apart joined wooden pieces, and dismantling structures without damaging materials.

12. Give two reasons for inclined towers construction or sloping outwards.

i. Stability – Towers and scaffolding are inclined slightly outward to counteract forces acting against them, such as wind or structural loads.
ii. Load distribution – Sloping helps distribute the weight of the structure evenly, preventing collapse or structural failure.

(a) Carefully study the diagram in fig. 1 and then answer the question that follows.
Calculate the number of rafters spaced at 2m.

Solution:
The given diagram represents a rectangular roof plan with dimensions:

- Length = 10 meters
- Width = 5 meters

Rafters are usually placed along the length of the roof, meaning we will divide the length by the spacing.
The formula for determining the number of rafters is:

Number of rafters = (Total Length / Spacing) + 1

Number of rafters = (10 / 2) + 1
Number of rafters = 5 + 1
Number of rafters = 6
Final answer: The number of rafters required is 6.

(b) Find the cost of timber for all trusses to be used in 13(a) if one truss is as shown in figure 2. Assume 1 ft run = 200 TSh.

Solution:
Step 1: Determine the total length of timber required for one truss.

From Figure 2, the truss consists of:

- Two rafters, each 15 ft.
- One horizontal beam (tie beam) of 24 ft.
- Two vertical members (king post) of 2 ft each.
- Two diagonal members (struts) of 2 ft each.

Total timber required per truss:

$= (2 \times 15) + (1 \times 24) + (2 \times 2) + (2 \times 2)$
$= 30 + 24 + 4 + 4$
$= 62$ ft per truss.

Step 2: Determine the total timber required for all trusses.
From 13(a), the number of trusses = 6.

Total timber required:

$= 6 \times 62$
$= 372$ ft.
Step 3: Calculate the total cost.
Cost per ft run = 200 TSh.
Total cost = 372×200
Total cost = 74,400 TSh.

(c) Explain how "dry rot" affects the quality of timber.

Dry rot is a type of fungal decay that occurs when timber is exposed to damp conditions for extended periods. It weakens the structure of the wood by breaking down the cellulose and lignin components, leading to loss of strength and deterioration. Below are the key effects of dry rot on timber quality:
i. Weakening of timber structure
Dry rot causes the fibers in the timber to break down, making the wood brittle and weak. This significantly reduces its load-bearing capacity and can lead to structural failures in buildings and furniture.
ii. Cracking and shrinkage
As the fungus spreads, it dehydrates the timber, causing it to shrink and develop cracks. This results in an unstable and unreliable structure.
iii. Discoloration

Timber affected by dry rot often changes color, appearing brown, dark, or even grey. This discoloration is a result of the breakdown of lignin, which holds wood fibers together.

iv. Formation of fungal spores

Dry rot fungi produce spores that spread to other wooden surfaces, accelerating the decay process in adjacent timber and posing a continuous threat if not treated properly.

v. Loss of aesthetic value

Timber affected by dry rot develops an unattractive, flaky, or crumbly texture, making it unsuitable for furniture and interior applications where appearance is important.

vi. Increased maintenance costs

Dry rot requires expensive repairs or replacement of timber in severe cases. This adds to the cost of maintaining wooden structures.

14(a) With the aid of sketches, explain pivoted windows.

A pivoted window is a type of window that rotates around a fixed pivot point, allowing it to open by swinging either horizontally or vertically. The pivot mechanism is placed at the center or slightly off-center of the window frame, enabling smooth rotation.

i. Horizontal pivoted windows

These rotate around a horizontal axis, allowing the window to open from the top or bottom. They are commonly used in ventilation systems as they allow air to flow efficiently.

ii. Vertical pivoted windows

These rotate around a vertical axis, meaning they open from the side. They are often used in commercial buildings to enhance airflow while maintaining a sleek design.

Advantages of pivoted windows:

- They provide better ventilation compared to sliding or casement windows.
- They are easy to clean since they can rotate fully.
- They eliminate the need for hinges, reducing maintenance.

Final answer: A pivoted window is designed to rotate around a central or off-center pivot point, either horizontally or vertically, providing improved ventilation, easy maintenance, and a modern design.

14(b)(i) Briefly explain glazing.

Glazing refers to the process of fitting glass panes into window frames to create a transparent barrier. It enhances insulation, security, and aesthetics in buildings.

Types of glazing include:

- Single glazing: Uses a single pane of glass, offering basic insulation but limited energy efficiency.
- Double glazing: Consists of two glass panes separated by a layer of gas or vacuum to improve thermal insulation and noise reduction.
- Triple glazing: Includes three glass panes for superior insulation and soundproofing.

Glazing improves building efficiency by reducing heat loss, minimizing sound transmission, and enhancing security by using reinforced or laminated glass.

14(b)(ii) State three methods used in glazing.

i. Putty glazing: Uses linseed oil-based putty to secure glass into a frame. It is a traditional method used in wooden window frames.

ii. Bead glazing. Involves fixing the glass with small wooden or plastic beads nailed or screwed onto the frame, providing a clean finish.

iii. Rubber gasket glazing: Uses flexible rubber seals to hold glass in place, commonly used in aluminum and steel window frames.

15(a)(i) Differentiate sash windows from casement windows.

i. Sash windows
- Designed with movable panels that slide vertically or horizontally.
- Commonly used in traditional homes, providing a classic look.
- Operate with counterweights or spring-loaded mechanisms to hold them in place.
- Limited in opening size as only part of the window can be moved at a time.

ii. Casement windows
- Hinged at the side and open outward like a door.
- Provide better ventilation as the entire window can be opened.
- Operate using a crank mechanism or handle.
- Offer a modern design suitable for energy-efficient homes.

Final answer: Sash windows slide open, while casement windows swing outward. Sash windows are more common in traditional designs, while casement windows are preferred for modern, energy-efficient homes.

15(a)(ii) State three basic ironmongery used for sash windows.

i. Sash lifts: Small handles used to lift and lower the sash window easily.

ii. Sash locks: Locking mechanisms that secure the window in place when closed, enhancing security.

iii. Sash pulleys: Used in traditional sash windows to guide the cord or chain that counterbalances the window.

(b) Name two types of louver ventilators.

i. Fixed louver ventilators. These are permanent openings with slanted slats that allow air to pass through while preventing rain or debris from entering.

ii. Adjustable louver ventilators. These have movable slats that can be opened or closed to control airflow and ventilation.

15(c)(i) What is adhesive?

Adhesive is a substance used to bond two surfaces together by creating a strong attachment between them. It can be natural or synthetic and is commonly used in woodworking, construction, and manufacturing.

(c)(ii) Mention three types of adhesives.

i. Polyvinyl acetate (PVA): A commonly used white glue for woodworking, crafts, and furniture assembly.

ii. Epoxy adhesive: A strong, durable adhesive used in construction, metal bonding, and marine applications.

iii. Contact adhesive: Used for laminates and flooring, bonding instantly when two coated surfaces are pressed together.

(d)(i) Briefly explain shrinkage in timber.
Shrinkage in timber occurs when moisture is lost from the wood, causing it to reduce in size. This happens because wood naturally contains water, and as it dries, the fibers contract. Shrinkage can lead to cracks, warping, or distortion in timber structures.

(ii) Explain why timber is seasoned.

Timber is seasoned to reduce its moisture content, making it more stable and durable for construction and furniture-making. It prevents warping, cracking, and fungal attacks while improving the strength and workability of the wood.