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: 2011**

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) The major difference between softwood and hardwood plants is that
A. softwood is broad-leaved while hardwood is not
B. softwood sheds leaves in winter while hardwood does not
C. softwood trees do not shade leaves in cold weather while hardwood does
D. hardwood does shade leaves in winter but has numerous pockets
E. the roots of softwood do not go deep in the ground

The correct answer is B. Softwood trees, which are mostly conifers, retain their needles year-round, while hardwood trees, which are deciduous, shed their leaves in the winter.

(ii) Mortise and tenon joints are used to
A. join stiles and rails in doors and windows
B. join floor boards and girders
C. join a rafter to the tie beam
D. disconnect the ceiling joist from the roof joist
E. strengthen a timber stair

The correct answer is A. Mortise and tenon joints are commonly used in woodworking to join stiles and rails in doors, windows, and frames, providing strong and durable connections.

(iii) The following are ingredients of animal glue
A. soluble albumin of beef blood
B. hooves, skin, and bones
C. hides and tendons of animals
D. skins, bones, and muscles
E. skull, horn, and hooves

The correct answer is C. Animal glue is traditionally made from the hides, tendons, and bones of animals, as these contain collagen, which produces a strong adhesive when processed.

(iv) Which of the following is not one of the main operations that can be carried out on a circular saw?
A. mitring and bevel cutting
B. ripping and cross-cutting wood
C. making straight edges and cutting moldings
D. making grooves, dadoes, and rabbets
E. making dovetail or irregular cuts

The correct answer is E. A circular saw is mainly used for straight cuts, including ripping, cross-cutting, bevel cutting, and making grooves, but it is not ideal for making dovetail or irregular cuts, which require specialized tools.

(v) The structural feature of a solid core flush door is
A. framed and battened

B. a framework of stiles and rails
C. a framework of stiles, rails, and panels
D. a skeleton of loosely boarded structure
E. laminated face veneer

The correct answer is E. Solid core flush doors are made with a laminated face veneer over a solid or composite core, providing strength and stability while maintaining a smooth appearance.

(vi) "Centering" in a term is defined as
A. the construction of a central point on an arch
B. a temporary support used to form bricks in the construction of arches
C. a temporary support used on the wall that shows signs of bulging or folding
D. the central block at the highest point of an arch
E. the string of a central point in the construction of curved structures

The correct answer is B. Centering refers to the temporary framework or support structure used to hold bricks or stones in place while constructing an arch until the mortar sets and the structure can support itself.

(vii) Figure 1 is showing part of an opening through a timber floor. Which among the labeled joints is a trimming joint?

The correct answer is B. Trimming joints are used to support and frame openings in floors, such as those needed for staircases or chimneys.

(viii) A baluster is used to
A. prevent people from falling off the stair
B. support the handrail in a balustrade
C. support the newel post in staircases
D. join the stringer to the newel post in a balustrade
E. support the steps on the underside of the stair

The correct answer is B. A baluster is a vertical post that supports the handrail in a staircase or balustrade, contributing to both aesthetics and safety.

(ix) Overhead costs are
A. an excess cost to the estimation of woodwork
B. the cost of paying labor and running the machines
C. miscellaneous costs that arise after the work is in progress
D. costs included in an estimate to cover unexpected profits
E. costs included in an estimate to cover for other unknown expenses

The correct answer is E. Overhead costs refer to additional expenses that are not directly related to material or labor but are necessary for the completion of a project, such as rent, maintenance, and administrative costs.

(x) What is "masher" in scaffolds?
A. a standard member provided to support the whole scaffolding
B. diagonal members used to increase the rigidity of the scaffolding
C. diagonal members fixed to resist wind force
D. vertical members which support ledgers and boards to be fixed
E. horizontal members fixed on the vertical support

The correct answer is B. Mashers are diagonal members in scaffolding that provide extra rigidity and stability, ensuring that the structure remains secure under load and environmental conditions.

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

List A:
i. Piece of timber running between the top of the roof and an eave
ii. A corner where two roof surfaces meet to form an external angle which exceeds 180°
iii. The horizontal board attached to the roof covering
iv. The edge of a sloping roof which projects outside a building
v. The horizontal piece of timber forming the ridge at the top of a roof
vi. The overhanging lowest part of the sloping roof
vii. The horizontal extending from the eave to the ridge of a roof
viii. Piece of timber standing between the valley of the roof and the ridge board
ix. A feature formed when two sloping surfaces meet to form an external angle less than 180°
x. An extension of the roof beyond the external wall

List B:
A. Gutter
B. Verge
C. Common rafter
D. Cable end
E. Fascia
F. Eave
G. Ridge
H. Ridge board
I. Hogging rafter
J. Valley
K. Soffit

Answers:

i - B. Verge
ii - J. Valley
iii - E. Fascia
iv - F. Eave
v - G. Ridge
vi - K. Soffit
vii - H. Ridge board
viii - I. Hogging rafter
ix - D. Cable end
x - A. Gutter

3. (a) What is meant by a scaffolding?

Scaffolding is a temporary structure used in construction to provide support for workers and materials when working at heights. It consists of metal or wooden planks, poles, and braces that allow safe access to elevated sections of buildings, bridges, or other structures.

(b) Mention three basic requirements of scaffolds.

i. Stability – The scaffold must be properly braced and securely anchored to prevent collapse.
ii. Safety – Guardrails, toe boards, and non-slip surfaces should be included to protect workers.
iii. Load capacity – The scaffold must be designed to support the weight of workers, tools, and materials.

4. Why are wood screws more preferred as fasteners than nails?

i. Wood screws provide a stronger grip because they create threads in the wood, preventing loosening over time.
ii. They allow for easy disassembly and reassembly without damaging the wood.
iii. Screws reduce the likelihood of splitting the wood, especially when working near the edges.
iv. They provide better resistance to withdrawal forces, making them more durable for joints under tension.

5. (a) Briefly explain two sizes of washing.

i. Rough washing – This is the initial cleaning process to remove heavy dirt and contaminants before fine finishing.
ii. Fine washing – A more detailed cleaning method used to achieve a smooth and polished surface before painting or finishing.

(b) What is meant by the term "raising the grain" as applied to wood finishing?

Raising the grain refers to the swelling of wood fibers when exposed to moisture, causing a rough texture. This process occurs when water-based stains or finishes are applied to raw wood, requiring sanding to smooth the surface before final finishing.

(c) Define the term "defect in timber".

A defect in timber is an imperfection or flaw in wood that affects its strength, appearance, or usability. Examples include knots, cracks, warping, and insect damage.

6. (a) Outline four objects of seasoning timber.

i. Reduces moisture content to improve wood stability and prevent shrinkage.
ii. Increases strength and durability by reducing susceptibility to fungal decay.
iii. Enhances workability by making wood easier to cut, shape, and join.
iv. Prevents warping and distortion, ensuring dimensional stability in finished projects.

(b) Define the following terms as used in timberworks.

i. Plank – A thick, flat, and wide piece of timber used for construction and flooring.
ii. Wane – The presence of bark or an uneven surface on the edge of a sawn timber board.

7. (a) List two points to be considered when choosing a suitable saw.

i. Type of material to be cut – Different saws are designed for cutting wood, metal, or plastic.
ii. Blade tooth configuration – The number and arrangement of teeth affect the smoothness and speed of the cut.

(b) Mention two ways for sawing of trees.

i. Cross-cut sawing – Cutting across the grain of the wood using a handsaw or chainsaw.
ii. Rip sawing – Cutting along the grain to produce planks or boards from logs.

8. (a) What are firring pieces and where are they used?

Firring pieces are narrow strips of timber used to create a slight slope on flat surfaces, such as roofs and floors, to allow water drainage or leveling. They are commonly used in roofing and flooring applications.

(b) Describe the shape and uses of the following types of tiles.

i. Under eaves tiles – Flat or slightly curved tiles placed at the lower edge of the roof to direct water runoff into gutters.
ii. "Tile and a half" tiles – Larger than standard tiles, used to maintain alignment and cover gaps at the edges or corners of tiled surfaces.

9. Define the following terms as applied in staircase construction.

(a) Stringer – A structural component running along the sides of a staircase to support the treads and risers.
(b) Rough bearer – A temporary support used during the construction of staircases to hold treads and risers in place.
(c) Nosing – The protruding edge of a stair tread that provides additional walking surface and enhances safety.
(d) Newel post – A vertical post at the beginning, end, or turning point of a staircase, supporting the handrail.

10. (a) What is the common use of a compass plane?

A compass plane is used for shaping and smoothing curved surfaces, such as arch moldings and circular edges in woodworking.

(b) What is the cutting angle of a plane knife? Explain its significance in woodwork.

The cutting angle of a plane knife is typically between 25 and 30 degrees. A properly sharpened cutting edge ensures smooth and precise shaving of wood, reducing resistance and improving efficiency.

11. Briefly explain how to fix a glass pane to a wooden window using putty.

i. Clean the window frame to remove dust and debris.
ii. Apply a thin layer of linseed oil to the frame to improve putty adhesion.
iii. Roll putty into a rope and press it into the rebate of the frame.
iv. Position the glass pane carefully on the putty and press it gently to secure it.
v. Apply another layer of putty around the glass edges and smooth it with a putty knife.
vi. Allow the putty to cure before painting or sealing the frame.

12. Explain where the following types of joints are applied.

(a) Tusk and tenon joint – Used in heavy timber framing, such as roof trusses and bridges, to provide strong load-bearing support.
(b) Stub mortise and tenon joint – Commonly used in furniture construction where the joint is not visible, such as chair frames.
(c) Secret haunched mitred mortise and tenon joint – Applied in high-quality cabinet making and door frames to create a strong yet concealed joint.
(d) Rebated haunched mortise and tenon joint – Used in window and door frames to provide additional strength and prevent twisting.

(b) Mention three parts of a circular saw machine and explain the function of each.

i. arbor (spindle) – The rotating shaft that holds and drives the saw blade. It is responsible for transferring power from the motor to the blade, ensuring smooth and stable cutting. A well-aligned arbor reduces vibration and increases precision in cutting.

ii. saw blade – The main cutting component of the circular saw. It consists of sharp teeth designed for cutting wood, metal, or plastic. The type of blade varies depending on the material being cut, with some blades designed for fine, smooth cuts and others for fast, rough cuts.

iii. rip fence – A guiding component that helps in making straight and accurate cuts. It is adjustable and positioned parallel to the blade to control the width of the material being cut. The rip fence ensures uniform cutting, reducing waste and improving efficiency.

(b) With the aid of sketches, differentiate collar roofs from close couple roofs.

i. collar roof – This type of roof consists of a pair of rafters joined by a horizontal tie beam known as a collar. The collar prevents the rafters from spreading outward and provides additional structural support. Collar roofs are commonly used in attic spaces or where additional headroom is needed.

ii. close couple roof – A roof design where the rafters meet at the ridge, and a horizontal tie beam is placed at the base of the rafters. This design helps distribute the roof load evenly to the walls, making it more stable. Close couple roofs are commonly found in residential houses.

(c) Sketch the following types of ironmongery and explain where each type is used.

i. butt hinge – A common hinge used in doors and windows, allowing them to pivot open and close smoothly. It consists of two rectangular plates connected by a central pin.

ii. tee hinge – A hinge shaped like the letter "T" used in gates, barn doors, and heavy-duty applications. It provides additional support for wide and heavy doors.

iii. parliamentary hinge – A type of hinge that allows doors or windows to swing open beyond 90 degrees, making it useful in places where maximum opening space is required.

iv. backflap hinge – A hinge commonly used in folding furniture, such as drop-leaf tables, to allow sections to fold and unfold smoothly.

v. clout nail – A thick nail with a large flat head used for fixing roofing felt, wooden battens, and fencing. It provides a strong hold for lightweight materials.

vi. panel pin – A thin nail used for fixing panels and lightweight moldings. It is commonly used in cabinet making and interior woodwork.

13. (a) Briefly explain the following.

i. skirting – A strip of material, usually wood or PVC, fixed along the base of an interior wall. It serves to protect the wall from damage, hide uneven floor edges, and enhance the aesthetic appeal of a room.

ii. dado rails – A horizontal molding installed on a wall, typically about one meter above the floor. It protects the wall from furniture impact and serves as a decorative feature in interior design.

iii. cornices – Decorative moldings installed at the junction of walls and ceilings. They add aesthetic appeal and help cover imperfections where the ceiling meets the wall.

(b) Briefly describe the structure and use of the following materials.

i. laminated boards – Consist of multiple layers of wood or other materials bonded together with adhesive. These boards are used in furniture, flooring, and wall paneling because they are strong, stable, and resistant to warping.

ii. block boards – Made of wooden strips sandwiched between layers of veneer. They are commonly used in doors, partitions, and furniture because of their high strength and lightweight properties.

iii. batten boards – Thin timber strips joined together edge-to-edge. They are used in roofing, flooring, and paneling, providing a durable and aesthetic surface.

(c) With the aid of sketches, briefly explain the construction of the following doors.

i. ledged matchboarded door – This door consists of vertical wooden planks joined together and supported by horizontal ledges. It is commonly used for garden sheds, barns, and simple residential doors.

ii. framed, ledged, and braced matchboarded door – This door includes a wooden frame, horizontal ledges, and diagonal braces to provide additional strength. It is suitable for external doors exposed to weather conditions.

14. (a) With the aid of a well-labeled sketch, show how timbering to a trench can be achieved in hard soils.

Timbering in hard soils is done using vertical sheeting boards supported by horizontal wailings and struts. This structure prevents the soil from collapsing into the trench during excavation.

(b) Assuming the sides of a trench are 900 mm deep, 600 mm wide, and 6 meters long in loose soil to be timbered, calculate the cost of timber required for the timbering work when the price of timber is Tshs. 1,300 per meter run for each type of piece (150 × 25 mm and 70 × 70 mm).

i. calculate the perimeter of the trench – The perimeter is calculated by adding the lengths of all sides.

ii. determine the length of timber required – The total timber needed includes vertical supports, horizontal braces, and struts.
iii. multiply the total timber length by the cost per meter run – The final cost is obtained by summing up the required timber and multiplying it by Tshs. 1,300 per meter run.

(c) Differentiate "false work" from "formwork" as applied in construction works.

i. false work – Temporary structures that provide support during construction, such as scaffolding and props used to hold formwork in place until the building structure gains strength.

ii. formwork – A temporary mold or framework used to shape wet concrete until it hardens. It determines the final shape of concrete structures like beams, columns, and walls.

(d) With the aid of a labeled sketch, describe a timber common (or stud) partition wall having a door opening.

A stud partition wall consists of vertical wooden studs, horizontal rails, and a framed opening for a door. The frame includes a lintel at the top and a sill at the bottom to provide support.

15. Mention four classes of woodworking hand tools and to each class give one example.

i. measuring tools – These tools help in taking accurate dimensions and markings before cutting. Example: tape measure, used for measuring lengths accurately.

ii. cutting tools – These tools are used for cutting wood into required shapes and sizes. Example: hand saw, used for cutting timber manually.

iii. shaping tools – These tools help refine the shape and smoothness of wood. Example: chisel, used for carving and making joints.

iv. fastening tools – These tools are used to join wooden pieces together. Example: hammer, used to drive nails into wood to secure connections.