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: 2017**

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.

i. A special hand tool used for fine flat finishing on longer surfaces and edges is
A. Jack plane
B. Router plane
C. Jointer plane
D. Smooth plane
E. Fore plane

The correct answer is D. Smooth plane. A smooth plane is designed for final finishing of wood surfaces, producing a fine and smooth finish on the material.

ii. The presence of small holes in the surface of timber that has been attacked by wood boring insects indicates
A. the timber is no longer infected
B. an adult beetle has emerged
C. insect borers have merged
D. the larvae have changed into pupae
E. the larvae have bored into the timber

The correct answer is B. an adult beetle has emerged. Small holes in timber indicate that wood-boring insects have completed their lifecycle and the adult beetles have emerged from the wood after pupation.

iii. The joint which is mostly used for joining boards glued or screwed together is
A. Butt joint
B. Mortise and Tenon joint
C. Mortise at tenon joint
D. Housing joint and dovetail joint
E. Tongue and groove joint

The correct answer is E. Tongue and groove joint. This joint is commonly used for joining boards as it provides a strong bond when glued or screwed together, preventing movement and gaps between boards.

iv. What are the two natural phenomena concerned with glue works?
A. Water resistance and heat
B. Cohesion and adhesion
C. Cohesion and suitable speed of set
D. Adhesion and suitable time for shelf
E. Shelf life and resistance to heat

The correct answer is B. Cohesion and adhesion. Adhesion refers to the ability of the glue to stick to different surfaces, while cohesion is the internal strength of the glue that holds the molecules together.

v. What is the function of latches used in doors?
A. to provide the required locking

B. to support the locking
C. to support double door
D. to close without locking
E. to improve the door appearance

The correct answer is A. to provide the required locking. Latches are used to secure doors in a closed position, providing the necessary locking mechanism to prevent unintended opening.

vi. Which one of the following is a classification of carcases construction?
A. Box construction and brick construction
B. Box construction and framed construction
C. Box construction and non-box construction
D. Box construction and non-framed construction
E. Non-box construction and framed construction

The correct answer is B. Box construction and framed construction. These are the main classifications of carcass construction used in furniture and cabinetry.

vii. Which one of the following grade-ranges of abrasive papers has the finest finishing grade?
A. 360 - 400
B. 50 - 60
C. 80 - 100
D. 120 - 180
E. 220 - 280

The correct answer is A. 360 - 400. Abrasive papers with higher grit numbers produce finer finishes, and the 360-400 range is used for very fine finishing work.

viii. Timbering to trench is defined as
A. a part of foundation in the building
B. a permanent support of a building
C. a basic type of the foundation trench
D. the temporary support of foundation
E. the temporary support to the sides of the trench

The correct answer is E. the temporary support to the sides of the trench. Timbering to trench is a method used to support the sides of an excavation to prevent soil collapse.

ix. The function of sole plate which is used in shoring works is
A. to distribute the load evenly over various components
B. to provide a fixing point for the various components
C. to allow the shores to be easily leveled
D. to keep the bottom of the shores in line

E. to provide good appearance of the work

The correct answer is A. to distribute the load evenly over various components. The sole plate is a structural element that helps in distributing the loads from the shores to prevent sinking or imbalance.

x. The horizontal distance between two successive riser faces is known as
A. Step
B. Riser
C. Going
D. Landing
E. Rise

The correct answer is C. Going. The going is the horizontal distance between the faces of two successive risers in a staircase, determining the depth of each step.

2. Matching items:

List A
(i) A device which is used to support a piece of wood when sawing, cutting, or chiseling
(ii) A small device used in preparing mouldings or rebating
(iii) A device which is used for holding a piece of wood to the heavy work table
(iv) A device used while gluing to hold and drive the parts being assembled together while the glue is setting
(v) A device used for holding and driving together right-angled mitre joints while gluing and pinning
(vi) A device used for holding work pieces when planing the ends square to a face or an edge
(vii) A device used to support a work piece when planing its surface
(viii) A device used to test the evenness of surfaces
(ix) A device used for checking the inside or outside diameters of cylindrical objects
(x) A device used for testing 90° of surfaces and for marking lines at right angles to a given surface

List B
A. Bench stop
B. Bench holdfast
C. Cramp
D. Corner clamp
E. Cutting board
F. G-cramp
G. Hawk
H. Mortise gauge
I. Rule
J. Saw horse
K. Shooting board

L. Sandy rest
M. Straight edge
N. Try square
O. Wing compass

Answers:
(i) J. Saw horse
(ii) H. Mortise gauge
(iii) B. Bench holdfast
(iv) C. Cramp
(v) D. Corner clamp
(vi) K. Shooting board
(vii) A. Bench stop
(viii) M. Straight edge
(ix) O. Wing compass
(x) N. Try square

3. (a) What is a carpentry and joinery workshop?

A carpentry and joinery workshop is a workspace equipped with tools and machines used for woodworking operations such as cutting, shaping, assembling, and finishing wood components for construction and furniture making. It includes workbenches, power tools, hand tools, and materials necessary for creating wooden structures.

(b) What is the importance of wearing safety boots, shoes, and riggers with steel toe caps or guards?

Wearing safety boots, shoes, and riggers with steel toe caps or guards is important for the following reasons:
i. Protection from falling objects – Prevents injuries caused by heavy materials or tools dropping on the feet.
ii. Prevention of puncture injuries – Protects against sharp objects such as nails and splinters.
iii. Stability and grip – Reduces the risk of slipping or losing balance on uneven or wet surfaces.
iv. Compliance with workplace safety regulations – Ensures adherence to occupational health and safety standards.

4. (a) What are the impelling tools in carpentry and joinery?

Impelling tools are tools used to drive or force materials together, often used for assembling wood components. These tools help in securing joints, fixing nails, and fastening parts.

(b) Give three examples of impelling tools.

i. Hammer – Used to drive nails into wood or other materials.
ii. Mallet – Used to apply force without damaging delicate wooden surfaces.
iii. Screwdriver – Used to drive screws into wood to join components together.

5. A 600 mm diameter plate saw has 95 teeth around its periphery. Calculate the tooth pitch.

The tooth pitch is calculated using the formula:
Pitch = Circumference / Number of Teeth

Circumference = $\pi \times$ Diameter
= 3.142×600 mm
= 1885.2 mm

Tooth pitch = 1885.2 mm / 95
= 19.8 mm

The tooth pitch is 19.8 mm.

6. Show by means of sketches the fast-growing ring portion and slow-growing ring portion for hardwood.

The fast-growing ring portion appears wider and lighter in color, while the slow-growing ring portion is narrower and darker. Since sketches cannot be directly drawn here, they can be represented visually by referring to textbook diagrams showing annual growth rings in trees.

7. Explain the uses of the following tools in veneering operations:

(a) Veneer hammer – Used to press veneer onto a surface while applying glue, ensuring it adheres firmly without air bubbles.
(b) Veneer clamp – Holds veneer sheets in position during gluing and pressing operations.
(c) Veneer saw – A small, fine-toothed saw used to cut veneer sheets accurately for fitting.
(d) Veneer knife – A sharp cutting tool used to trim veneer edges and shape the sheets precisely.

8. Outline the advantages of using machines and portable powered tools in our daily life.

i. Increased efficiency – Machines complete tasks faster compared to manual labor.
ii. Improved precision – Ensures accuracy in measurements and cutting.
iii. Reduced physical strain – Minimizes human effort and fatigue.
iv. Versatility – Machines and portable tools can handle multiple tasks with different attachments.
v. Enhanced safety – Reduces the risk of injuries associated with manual tools.

9. Write down the uses of the following ironmongery:

(a) Casement stay – Used to hold a casement window in an open position at different angles.
(b) Casement fastener – A locking device used to secure casement windows in a closed position.
(c) Hinges – Allow doors, windows, and cabinets to pivot open and close smoothly.
(d) Catches – Used to hold cabinet doors and other closures in place without the need for locks.

10. Name four important factors that should be taken into account for the adhesive to change from its liquid state into a solid state.

i. Temperature – The adhesive must be applied at an optimal temperature for curing.
ii. Pressure – Proper pressure ensures even bonding and removal of air gaps.
iii. Moisture content – The materials being bonded should have the correct moisture level.
iv. Setting time – The adhesive should be given enough time to dry and cure properly.

11. Define the following terms as used in the woodwork industry:

(a) Cabinet scrapers – Thin steel tools used to smooth and refine wooden surfaces.
(b) Abrasive paper – A type of sandpaper used to smooth wood and remove imperfections.
(c) Rasps – Coarse-toothed tools used for shaping wood by removing material quickly.
(d) Varnish – A protective liquid finish applied to wood to enhance appearance and durability.

12. (a) For each of the following operations, give the appropriate type of machine to be used:

(i) Planing surfaces and edges of the board
The appropriate machine for this task is a surface planer or a thickness planer. A surface planer is used to smooth and straighten one face and one edge of a board to ensure that the surface is level and uniform. A thickness planer, on the other hand, is used to bring a wooden board to a uniform thickness by removing excess material from its surface. These machines help in preparing timber for joinery and furniture making by ensuring that all pieces fit accurately.

(ii) Grooving, mitring, ripping, and rebating
The appropriate machine for these tasks is a circular saw or a spindle moulder. A circular saw is widely used in woodworking shops to cut timber along or across the grain. It can be fitted with different blades to perform grooving, mitring, ripping, and rebating operations. A spindle moulder is also used for shaping wood by cutting grooves and rebating edges, especially in furniture and cabinetry.

(iii) Cylindrical and circular shapes
The appropriate machine for this task is a lathe machine. A wood lathe is used to create cylindrical objects such as table legs, stair spindles, and decorative wood pieces. The machine rotates the wood while a cutting tool shapes it into the desired form. Wood lathes are essential in woodworking where rounded designs are required.

(b) Define veneer as applied in woodwork.

Veneer refers to a thin sheet of high-quality wood that is peeled or sliced from a log and used to cover surfaces of lower-grade wood or manufactured boards. Veneers enhance the appearance of furniture, doors, and panels, making them look like they are made from solid hardwood. They are commonly used in furniture making to achieve decorative finishes and improve durability. The application of veneer helps in reducing the cost of furniture production by using less expensive materials underneath while maintaining a premium appearance on the surface.

13. (a) With the aid of a neat sketch, explain the procedures on how a nail can be removed from a piece of board.

The process of removing a nail from wood involves several steps to avoid damaging the surface of the wood. First, a claw hammer or a nail puller is positioned around the nail head to grip it securely. Next, the handle of the tool is pressed downward to create leverage, which helps in lifting the nail out. If the nail is deeply embedded, a rocking motion is applied while pulling to gradually loosen it. Once the nail is loosened, pliers can be used to grip the nail for a final extraction. This process ensures that the nail is removed without breaking or splitting the wood surface.

(b) How would you prevent splitting or the nail from bending when nailing in hardwood boards?

Splitting or bending of nails when working with hardwood can be avoided using the following methods:

i. Drilling pilot holes before nailing. Since hardwood is dense and resistant, a small hole should be drilled to guide the nail, reducing resistance and preventing splitting.

ii. Blunting the nail tip. Before driving the nail into the wood, slightly dulling its sharp tip helps to crush the wood fibers instead of forcing them apart, minimizing the chance of splitting.

iii. Using appropriate nails. Choosing nails that are thin and have sharp points reduces the chances of bending and splitting.

iv. Nailing at an angle. Instead of hammering the nail straight, driving it at a slight angle helps distribute the force evenly and prevents splitting.

(c) Outline the factors that determine the holding power of a nail in order to be used satisfactorily.

The effectiveness of a nail in holding wood depends on several factors:

i. The length and diameter of the nail. Longer and thicker nails penetrate deeper into the wood, providing a stronger grip and holding power.

ii. The type of wood. Hardwoods provide a firmer grip compared to softwoods because they have denser fibers that hold the nail tightly.

iii. The nail surface texture. Nails with ridges, barbs, or coatings such as galvanized finishes provide better resistance to withdrawal, increasing holding power.

iv. The nailing technique. Proper positioning and driving of the nail at an appropriate depth ensure that it holds firmly without loosening over time.

(d) What information is necessary to state when ordering or purchasing nails?

i. The type of nail. Different types of nails are designed for specific applications, such as panel pins, wire nails, masonry nails, and roofing nails.

ii. The length and diameter of the nail. Specifying the correct size ensures that the nail will be suitable for the intended use.

iii. The coating or finish. Some nails are galvanized or coated with rust-resistant materials to improve durability, especially for outdoor use.

iv. The quantity required. It is important to specify the number of nails needed for a given project to avoid shortages or excess materials.

14. Name and explain five tools which will facilitate the work when working on a field site.

i. Hand saw. This is used to cut timber into required lengths and shapes. It is a basic tool in carpentry that allows for making precise cuts in wood when electrical power tools are unavailable.

ii. Claw hammer. This tool is used for driving nails into wood and also for removing them when necessary. The curved claw end provides leverage for pulling out nails easily.

iii. Chisel. A chisel is used for shaping wood and cutting joints. It is especially useful for creating mortises, dovetails, and other precision cuts.

iv. Tape measure. This tool is used to take accurate measurements before cutting and assembling wood pieces, ensuring proper alignment and fitting.

v. Spirit level. A spirit level is used to check the alignment of surfaces, ensuring that structures are built straight and balanced.

15. (a) Briefly explain the general uses of files.

i. Smoothing rough surfaces. Files are used to remove excess material from wood, metal, or plastic to create a smooth finish.

ii. Sharpening tools. Files are commonly used to refine cutting edges of tools such as saws and chisels.

iii. Shaping workpieces. Different types of files help in creating precise contours and profiles in wood and metal.

iv. Finishing metal components. Files are used in metalworking to remove burrs and refine edges after cutting.

(b) With the aid of neat cross-section sketches, list common shapes of files used in woodcraft.

i. Flat file. It has a rectangular cross-section and is used for general filing and smoothing of surfaces.

ii. Round file. This file has a circular cross-section and is used for enlarging holes and filing curved surfaces.

iii. Half-round file. It has both a flat and a curved surface, making it suitable for working on both flat and concave surfaces.

iv. Triangular file. This type has a triangular cross-section and is used for sharpening saw teeth and filing internal angles.

v. Square file. It has a square cross-section and is used for filing square-shaped openings and slots.

16. (a) With the aid of neat sketches, explain:

(i) Star shake. This is a natural defect in timber where cracks radiate outward from the center of the log. It is caused by internal drying stresses that form during the seasoning process.

(ii) Cup shake. This defect appears as a curved crack along the growth rings of timber. It occurs due to excessive moisture changes, causing separation between the rings.

(iii) Heart shake. This defect is a deep crack originating from the pith (center) of the log and extending outward. It results from internal stress and is commonly found in large-diameter trees.

(b) Briefly explain the following methods of timber preservative:

(i) Brushing and spraying. This method involves manually applying preservatives to wood using a brush or a spray gun. It is suitable for protecting surfaces from decay and insects but does not penetrate deeply into the wood.

(ii) Dipping or immersing. In this method, timber is submerged in a tank filled with preservative chemicals to allow absorption. It ensures better penetration than brushing or spraying.

(iii) Steaming. This process uses steam pressure to force preservatives deep into the wood fibers, making it resistant to decay and insect attack.

(iv) Diffusion. In this method, preservatives are applied to freshly cut wood, allowing natural absorption over time to enhance protection against fungal and insect damage.