

**THE UNITED REPUBLIC OF TANZANIA  
NATIONAL EXAMINATION COUNCIL OF TANZANIA  
FORM TWO NATIONAL ASSESSMENT**

**074**

**WOODWORK AND PAINTING ENGINEERING**

**Time: 2:30 Hours.**

**SOLUTIONS**

**Year: 2024**

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**Instructions**

1. This paper consists of sections **A**, **B** and **C** with a total of **ten (10)** questions.
2. Answer **all** questions.
3. Section A carries **15** marks; section B carries **70** marks and section C carries **15** marks.
4. All writing must be in **black** or **blue** ink and drawings must be in **pencil**.
5. Cellular phones and unauthorized materials are **not allowed** in the examination room.
6. Write your **Assessment Number** at the top-right hand corner of every page.

<b>FOR EXAMINER'S USE ONLY</b>		
<b>QUESTION NUMBER</b>	<b>SCORE</b>	<b>EXAMINER'S INITIALS</b>
1		
2		
3		
4		
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6		
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8		
9		
10		
<b>TOTAL</b>		
<b>CHECKER'S INITIALS</b>		

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## SECTION A (15 Marks)

Answer all questions from this section

1. For each of the items (i)–(x), choose the correct answer from among the given alternatives and write its letter in the box provided.

(i) Select the appropriate machines for cutting external curved shape in woodwork.

- A. Circular saw
- B. Cross cut saw
- C. Gig saw
- D. Band saw

Correct answer: D. Band saw.

Reason: A band saw has a continuous flexible blade that allows smooth and accurate cutting of external curved shapes in wood, unlike circular or cross cut saws which are mainly for straight cuts, and a gig saw which is limited to thinner materials.

(ii) Bandages should be applied firmly enough to keep efficient dressing. The following are considered as function of dressing except

- A. Ling bleeding
- B. Reducing blood circulation
- C. Avoid further bleeding
- D. Absorbing discharges

Correct answer: B. Reducing blood circulation.

Reason: A dressing is intended to stop bleeding, absorb discharges, and protect a wound, but it should not reduce blood circulation because that can cause tissue damage.

(iii) If 2.0 litres of short oil varnish estimated to paint 1.5 m<sup>2</sup> of indoor structure, recommend the amount of oil to be used if the total surface area of indoors structure to be painted is 300 m<sup>2</sup>.

- A. 400 litres

- B. 150 litres
- C. 250 litres
- D. 200 litres

Correct answer: A. 400 litres.

Reason:

2.0 litres covers  $1.5 \text{ m}^2$

1 litre covers  $1.5 \div 2.0 = 0.75 \text{ m}^2$

$300 \text{ m}^2$  requires  $300 \div 0.75 = 400$  litres

Therefore 400 litres is required.

(iv) TAMESA workers are required to paint ten government vehicles. Identify the appropriate painting material that will be used for the required task.

- A. Aluminium paint
- B. Colloidal paint
- C. Cellulose paint
- D. Bituminous paint

Correct answer: C. Cellulose paint.

Reason: Cellulose paint dries quickly, gives a smooth finish, and is commonly used for motor vehicles, unlike bituminous or aluminium paints which are for protective or industrial surfaces.

(v) Identify the finishes that can be used to emphasize wood grain and impart colour into the surface of the stock.

- A. Wood sealer
- B. Wood filler
- C. Wood stain
- D. Wood varnish

Correct answer: C. Wood stain.

Reason: Wood stain penetrates the wood surface, enhances the natural grain, and adds colour without forming a thick surface film.

(vi) A sign writer won a tender that required her to apply stencilling. She decided to use the stencil without removing the dirt. What type of defect the sign writer might cause due to her decision?

- A. Creep
- B. Lifting paint
- C. Smudging
- D. Bittiness

Correct answer: C. Smudging.

Reason: Dirt under a stencil prevents proper adhesion and sharp edges, causing the paint to spread unevenly and blur the design, which results in smudging.

(vii) Which warm colour will be produced when red, orange and yellow colours are mixed?

- A. Advance colour
- B. Monochromatic colour
- C. Achromatic colour
- D. Discordant colour

Correct answer: A. Advance colour.

Reason: Warm colours such as red, orange, and yellow are classified as advancing colours because they visually appear to move forward and create a warm, energetic effect.

(viii) Double boiled linseed oil is a binder which can increase alkali attack behaviour of oil paint. Suggest the painting surface in which oil paint can be used with such a binder.

- A. New iron steel surface

- B. Plastered surface
- C. Galvanized iron surface
- D. Repainting old surface

Correct answer: D. Repainting old surface.

Reason: Alkali attack is severe on new plastered surfaces, while old painted surfaces have reduced alkalinity, making them suitable for oil paint with linseed oil binder.

(ix) It was reported that during painting the coating was applied but the undercoat or first coat is seen through the top coat. What might be the cause of such surface defect?

- A. Painting sections of a surface at different times
- B. Damaged by rain or condensation
- C. Draughts, a damp surface or high humidity
- D. Over-brushing, using thin paint and wrong colour undercoat

Correct answer: D. Over-brushing, using thin paint and wrong colour undercoat.

Reason: Thin paint layers and excessive brushing reduce covering power, allowing the undercoat to show through the top coat.

(x) Varnish is a resinous solution forming hard transparent coating when applied in a thin film. What is its main use?

- A. To enable timber furniture to be attractive to the customer
- B. To smooth timber furniture after being made in workshop
- C. To enable timber furniture dry quickly after being made
- D. To protect and improve the appearance of furniture

Correct answer: D. To protect and improve the appearance of furniture.

Reason: Varnish forms a transparent protective layer that enhances the appearance of wood while protecting it from moisture, wear, and dirt.

2. Match the description of painting purpose in List A with the corresponding painting term in List B by writing a letter of the correct response below the item number in the table provided. The responses from List B may be used more than once.

<b>List A</b>	<b>List B</b>
(i) To protect the material surface.	A. Sanitation
(ii) To make the material surface washable.	B. Decoration
(iii) To provide a pleasing appearance of the material surface.	C. Preservation
(iv) To prevent rusting of the material surface.	D. Levitation
(v) To denote the material surface.	E. Induction
	F. Insulation
	G. Identification
	H. Limitation

**Answers**

<b>List A</b>	<b>(i)</b>	<b>(ii)</b>	<b>(iii)</b>	<b>(iv)</b>	<b>(v)</b>
List B	C	A	B	C	G

## SECTION B (70 Marks)

Answer all questions from this section

3. Suppose you are given a site to paint using various types of cement paint:

(a) What would be the appropriate composition of the paint according to its nature?

Cement paint is composed mainly of white or coloured cement, fine mineral fillers, pigments, and suitable chemical additives. The cement acts as the binding material that gives strength and adhesion to masonry surfaces, while pigments provide colour and resistance to fading.

Another important component is hydrated lime or plasticizers, which improve workability and reduce cracking after application. These additives help the paint spread evenly and penetrate porous cement surfaces effectively.

Water is also a key component, as it initiates the hydration process of cement. The correct proportion of water ensures proper setting, durability, and uniform appearance of the painted surface.

(b) How could you prepare the cement paint?

Cement paint is prepared by first measuring the required quantity of paint powder and clean water according to the manufacturer's instructions. This ensures the correct consistency and performance of the paint.

The powder is slowly added into water while stirring continuously to avoid the formation of lumps. Mixing should be done thoroughly until a smooth, homogeneous paste is obtained.

After mixing, the paint is allowed to stand for a short time so that all particles are fully wetted. It is then stirred again before application to maintain uniformity during painting.

(c) What will you do to get the quality of a painting work on the cement painted surface?

The surface must be properly prepared by cleaning off dust, grease, loose particles, and old flaking paint. A clean surface allows good adhesion of the cement paint.

The surface should be adequately dampened with clean water before painting. This prevents rapid absorption of water from the paint, which could otherwise cause poor bonding and uneven finish.

Painting should be done in thin, even coats using proper tools such as brushes or rollers. Adequate curing by light water spraying after painting improves strength, durability, and appearance.

4. Painters and decorators should be able to collect and select basic hand tools to enable surface preparation during minor repairs of computer laboratory. How would you use the following hand tools to repair computer laboratory?

(a) Claw hammer

A claw hammer is used to drive nails into wooden surfaces during repairs such as fixing loose boards or frames. The striking face is used carefully to avoid damaging surrounding materials.

The claw end is used to remove unwanted or damaged nails from walls, furniture, or fittings. This helps in preparing surfaces for repainting without leaving protrusions.

(b) Pincer

A pincer is used mainly for pulling out nails or pins embedded deep in wood or plaster. Its gripping jaws provide strong leverage for safe removal.

It is also used to cut small wires or fasteners that may interfere with surface preparation, ensuring a smooth and safe working area.

(c) Nail punch

A nail punch is used to drive nail heads slightly below the surface of wood. This creates a smooth surface that can be filled and painted over neatly.

By recessing nail heads, the tool helps prevent visible nail marks and ensures an even paint finish on repaired surfaces.

(d) Wire brush

A wire brush is used to remove rust, old paint, loose plaster, and dirt from metal or masonry surfaces. This improves paint adhesion.

It is especially important when preparing metal frames or grills in a computer laboratory to prevent corrosion under new paint.

(e) Screw driver

A screw driver is used to remove or tighten screws on fixtures such as sockets, fittings, and furniture before painting.

Removing fittings allows proper painting behind them and prevents paint damage to electrical or mechanical components.

5. A grinder can be dangerous tool if the user fails to follow safety rules of operating tools. Recommend five safety rules to be followed in order to minimize the risk of the grinder.

(a) The operator should always wear protective equipment such as goggles, gloves, and ear protection to prevent injuries from sparks and noise.

(b) The grinding wheel should be checked for cracks or damage before use to avoid breakage during operation.

(c) The grinder must be firmly held with both hands and operated with a stable stance to maintain control at all times.

(d) Sparks should be directed away from the body and from flammable materials to reduce the risk of fire or burns.

(e) The grinder should be switched off and unplugged before changing discs or making adjustments to prevent accidental start-up.

6. Varnish and paint are two materials used in the finishes works applied on the different surface with the same procedure.

(a) What is the major difference between the two materials?

Paint contains pigments that provide colour and opacity, covering the surface completely. It hides the natural appearance of the material beneath it.

Varnish is transparent and does not contain colouring pigments. Its main function is to protect the surface while enhancing the natural grain and texture, especially on wood.

(b) How do they differ in the process of application?

Paint is usually applied over a prepared and sometimes primed surface in one or more coats to achieve full coverage and colour uniformity.

Varnish is applied in thin, clear coats, often with light sanding between coats, to achieve a smooth, glossy, or matte protective finish without hiding the surface.

7. Differentiate the following colour as used in painting works:

(a) Paste colour and retiring colours

Paste colours are thick, concentrated colours used mainly for mixing and tinting paints. They are strong in colour strength and used in small quantities.

Retiring colours are cool or dull colours that appear to recede visually. They are used to make spaces feel larger and less prominent.

(b) Split complementary and complimentary colours.

Complementary colours are pairs of colours directly opposite each other on the colour wheel, such as red and green. They provide strong contrast and visual impact.

Split complementary colours involve one base colour and two colours adjacent to its complement. This scheme offers contrast while being less harsh and more balanced.

8. The school management planned to paint classrooms but they still have difficulties in making decision on the type of paint to be used.

(a) Convince them to use water paint instead of oil paint by providing five facts.

(i) Water paint dries faster, allowing classrooms to be used sooner after painting.

(ii) It has low odour, making it safer and more comfortable for students and teachers.

(iii) Water paint is easier to clean from tools using water, reducing maintenance cost.

(iv) It is environmentally friendly with low levels of harmful solvents.

(v) It allows walls to breathe, reducing problems of blistering and peeling.

(b) Despite having convinced the school management to use water paint, remind them about five disadvantages of it.

(i) Water paint is less durable on surfaces exposed to frequent washing.

(ii) It is not suitable for surfaces exposed to heavy moisture without proper preparation.

(iii) It provides less gloss compared to oil paint.

(iv) It may stain easily if low-quality paint is used.

(v) It requires well-prepared surfaces for good adhesion and finish.

9. Provide the uses of the following types of dyes:

(a) Direct dyes

Direct dyes are used mainly for colouring cotton, rayon, and other cellulose fibres. They are applied directly without the need for mordants.

They are commonly used in textile industries for fabrics that require bright colours at low cost.

(b) Acidic dyes

Acidic dyes are used for dyeing wool, silk, and nylon fibres. They require an acidic medium for proper bonding.

They are widely used where bright shades and good colour penetration are required, such as in garments and carpets.

### SECTION C (15 Marks)

Answer question number 10.

10. Suppose you have to supply painting materials at a computer laboratory owned by a government school having 20 m length, 6 m width, 8 m height with door and window opening being 4 m<sup>2</sup> and 15 m<sup>2</sup>;

(a) Which nine criteria would you consider when selecting the appropriate painting materials for your tender?

(i) The type of surface to be painted, such as concrete, plaster, wood, or metal, because different surfaces require specific paints.

(ii) Durability of the paint to withstand frequent use and cleaning in a computer laboratory environment.

- (iii) Cost effectiveness to ensure the project remains within budget while meeting quality standards.
  - (iv) Drying time to minimize disruption of school activities.
  - (v) Environmental and health safety, especially low toxicity and low odour.
  - (vi) Availability of the paint materials in the local market to avoid delays.
  - (vii) Colour suitability for learning environments, ensuring good lighting and comfort.
  - (viii) Ease of maintenance and cleaning after application.
  - (ix) Compatibility with existing painted surfaces to prevent peeling or reactions.
- (b) How much will the project cost if 5 litres of painting materials which is sold at Tsh 8000 per litre was used to paint 35 m<sup>2</sup> of surface and 25% of this cost was used as labour charge?

Cost per litre = Tsh 8000

Cost of 5 litres =  $5 \times 8000$

Cost of 5 litres = Tsh 40000

Area covered by 5 litres = 35 m<sup>2</sup>

Total area to be painted

Wall area =  $2(20 \times 8) + 2(6 \times 8)$

Wall area =  $320 + 96$

Wall area = 416 m<sup>2</sup>

Openings area =  $4 + 15$

Openings area = 19 m<sup>2</sup>

Net area =  $416 - 19$

Net area = 397 m<sup>2</sup>

Paint required

$$\text{Paint sets} = 397 \div 35$$

$$\text{Paint sets} \approx 11.34$$

Total paint cost

$$\text{Paint cost} = 11.34 \times 40000$$

$$\text{Paint cost} \approx \text{Tsh } 453600$$

Labour cost

$$\text{Labour} = 25\% \text{ of } 453600$$

$$\text{Labour} = 113400$$

Total project cost

$$\text{Total cost} = 453600 + 113400$$

$$\text{Total cost} = \text{Tsh } 567000$$