higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE:
MULTIDISCIPLINARY DRAWING OFFICE PRACTICE

MECHANICAL AND DRAWING-OFFICE ORIENTATION

(8090184)

15 April 2020 (X-paper)
09:00–12:00

This question paper consists of 6 pages.

249Q1A2015

Copyright reserved

DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE:
MULTIDISCIPLINARY DRAWING-OFFICE PRACTICE
MECHANICAL AND DRAWING OFFICE ORIENTATION
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer all the questions.
2. Read all the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Start each question on a new page.
5. Use only a black or blue pen.
6. Write neatly and legibly.

Copyright reserved

QUESTION 1: DRAWING-OFFICE ORIENTATION

1.1 Give THREE types of engineering-drawing scales. (3)

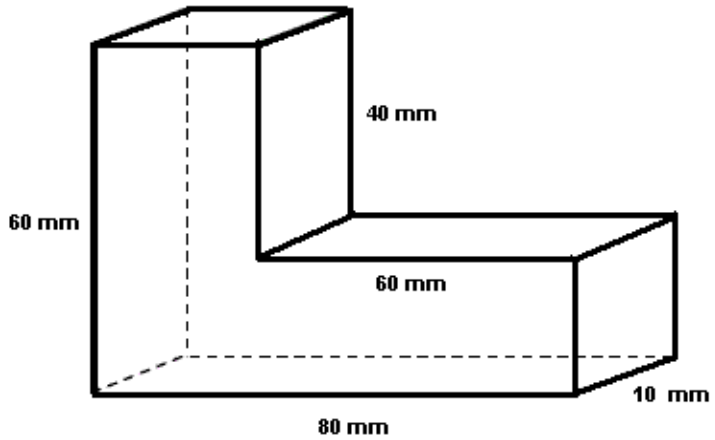
1.2 Explain each of the following types of technical drawings:

1.2.1 Assembly drawings

1.2.2 Detail drawings

(2 × 2) (4)

1.3 The sketch below shows an isometric view of an object.



Draw, freehand, a first-angle orthographic projection of the object showing the front, left and top views. (3)

1.4 Make a neat sketch of the symbol for first-angle orthographic projection. (2)

[12]

QUESTION 2: DRAWING-OFFICE LAYOUT AND EQUIPMENT

2.1 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (2.1.1–2.1.6) in the ANSWER BOOK.

2.1.1 A scale of 4:1 represents data four sizes smaller than the natural size.

2.1.2 Assembly drawings show the production of a product.

2.1.3 Diameter should be used when dimensioning half a circle.

2.1.4 Lighting cannot be bright or subdued.

2.1.5 UPS stands for uninterruptible power system.

2.1.6 Computer-aided draughting (CAD) is becoming outdated and obsolete in the drawing office.

(6 × 1) (6)

Copyright reserved

2.2 State FOUR aspects to include in preventative maintenance of drawing-office equipment. (4)
[10]

QUESTION 3: ENGINEERING MATERIALS AND HEAT-TREATMENT EQUIPMENT

3.1 Choose a term from COLUMN B that matches a description in COLUMN A. Write only the letter (A–I) next to the question number (3.1.1–3.1.5) in the ANSWER BOOK.

COLUMN A		COLUMN B	
3.1.1	Materials can resist fractures by a stretching force	A	ductility
3.1.2	Material can resist fractures when subjected to continuous bending forces in opposite directions	B	flexibility
3.1.3	Metals can be extended in all directions by hammering or rolling without cracking	C	brittleness
3.1.4	Material remains bent after applied pressure has been removed	D	compressibility
3.1.5	Metal can withstand considerable elongation under tension before rupture (depending on tenacity)	E	tenacity
		F	toughness
		G	malleability
		H	elasticity
		I	hardness

(5 × 1) (5)

3.2 Indicate whether the following statements are TRUE or FALSE by writing only 'True' or 'False' next to the question number (3.2.1–3.2.4) in the ANSWER BOOK. Correct the statement if it is FALSE.

3.2.1 The higher the carbon content in steel, the softer the steel will be.

3.2.2 Medium-carbon steel is stronger than low-carbon steel and heat-treatment increases its toughness and hardness.

3.2.3 The process of coating steel with zinc is known as chroming.

3.2.4 The process of making pig iron includes the smelting of iron ore, coke and flux in a cupola furnace.

(4 × 2) (8)

3.3 Explain the *annealing* heat-treatment process. (2)
[15]

QUESTION 4: MACHINING

4.1 Explain, with the aid of a neat, labelled sketch, the clearance fit. Show the terms used for clearance fits. (4)

4.2 Name TWO factors on which the method of holding a workpiece depends. (2)

4.3 Differentiate between a *milling machine* and a *lathe machine*. (2 + 2) (4)

[10]

QUESTION 5: MEASURING INSTRUMENTS

5.1 Briefly explain how a thread-pitch gauge is used to check the correctness of threads. (3)

5.2 Draw a labelled diagram of a vernier height gauge. (7)

[10]

QUESTION 6: KEYS, PULLEYS, CLUTCHES, COUPLINGS AND SCREW THREADS

6.1 Draw a simple sketch of a Woodruff key. (1)

6.2 Name the TWO types of self-aligning couplings. (2)

6.3 Give TWO causes of slip in a cone clutch and explain how it can be remedied. (2 × 2) (4)

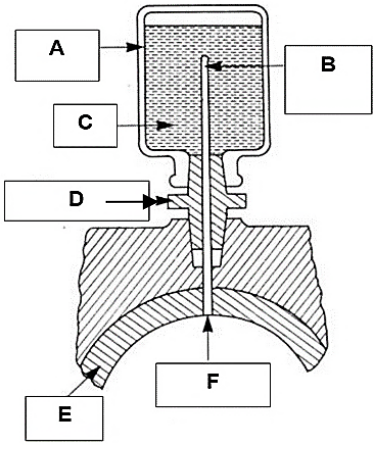
6.4 Why is a cone pulley used on machinery? (1)

6.5 Explain the *pitch* on a screw thread. (1)

[9]

QUESTION 7: BEARINGS AND LUBRICATION

7.1 The diagram below shows a needle lubricator.



Label the needle lubricator by writing only the answer next to the letter (A–F) in the ANSWER BOOK. (6 × 1) (6)

7.2 Bearings are manufactured in different sizes and designs to provide for the various loads and directions of the forces acting on the bearing.

Discuss the follow two areas to consider when manufacturing bearings:

7.2.1 The magnitude of load

7.2.2 The direction of load for a thrust ball bearing

(2 × 2) (4)
[10]

QUESTION 8: GEAR DRIVES

8.1 Draw a spur gear and show the following components:

- Circular pitch
- Dedendum
- Tooth thickness
- Addendum
- Clearance (7)

8.2 Define the term *pressure angle* and give the TWO commonly used pressure angles. (1 + 2) (3)
[10]

QUESTION 9: VALVES, PUMPS AND PIPE FITTINGS

9.1 List FOUR faults commonly experienced with sliding expansion joints. (4)

9.2 Draw a centrifugal pump and explain its working principle. (5 + 3) (8)

9.3 Differentiate between a *rotary control valve* and a *relief valve*. (2)
[14]

TOTAL: 100

Copyright reserved