BOARD OF STUDIES
NEW SOUTH WALES

2011

HIGHER SCHOOL CERTIFICATE EXAMINATION

Industrial Technology
Metal and Engineering Technologies

General Instructions

- Reading time – 5 minutes
- Working time – $1\frac{1}{2}$ hours
- Write using black or blue pen
  Black pen is preferred
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of page 5

Total marks – 40

Section I Pages 2–4

10 marks

- Attempt Questions 1–10
- Allow about 20 minutes for this section

Section II Pages 5–8

15 marks

- Attempt Questions 11–14
- Allow about 35 minutes for this section

Section III Page 9

15 marks

- Attempt Question 15
- Allow about 35 minutes for this section

Section I

10 marks
Attempt Questions 1–10
Allow about 20 minutes for this section

Use the multiple-choice answer sheet for Questions 1–10.

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1 Brass is an alloy of

(A) zinc and lead.

(B) copper and zinc.

(C) copper and nickel.

(D) aluminium and zinc.

2 Which metal does NOT benefit from the use of a cutting fluid when being machined?

(A) Stainless steel

(B) Mild steel

(C) Tool steel

(D) Cast iron

3 What is the correct name for the type of drill bit shown?

(A) Centre

(B) Pilot

(C) Taper

(D) Twist

4 What lathe process is known as *knurling*?

(A) Drilling using the tail stock

(B) Maintaining a conical shape

(C) Forming a pattern on a cylindrical surface

(D) Removing waste metal with a roughing tool

5 To produce galvanised iron, mild steel is coated with

(A) aluminium.

(B) bronze.

(C) nickel.

(D) zinc.

6 *Work hardening* is the strengthening of a metal by

(A) heating.

(B) plastic deformation.

(C) heating and quenching.

(D) heating and air cooling.

7 Which gas is best to use when MIG welding mild steel?

(A) Argon

(B) Liquid petroleum

(C) Nitrogen

(D) Oxygen

8 Which procedure should be followed to safely light an oxy-acetylene gas torch?

(A) Light acetylene only

(B) Light acetylene first, and then turn on oxygen

(C) Light oxygen first, and then turn on acetylene

(D) Turn both oxygen and acetylene on, then light

9 For the construction of a tool box, 25 rivets are needed.

How many toolboxes could be constructed using a box of 1500 rivets, allowing for 5% waste?

(A) 30

(B) 45

(C) 57

(D) 60

10 What is the cutting speed, in revolutions per minute, for turning a cast iron cylinder that has a 50 mm radius?

$$\text{rpm} = \frac{\text{cutting speed in metres}}{\text{circumference in metres}}$$

Material	*Cutting Speed*
Mild steel	25 000 mm/min
Cast iron	25 000 mm/min
Brass	90 000 mm/min
Hard steel	12 000 mm/min

(A) 80 rpm

(B) 160 rpm

(C) 500 rpm

(D) 800 rpm

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Section II

15 marks
Attempt Questions 11–14
Allow about 35 minutes for this section

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 11 (2 marks)

How could the bolt shown be produced? **2**

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Question 12 (3 marks)

Describe the processes used to make this turned handle from a section of round bar. **3**

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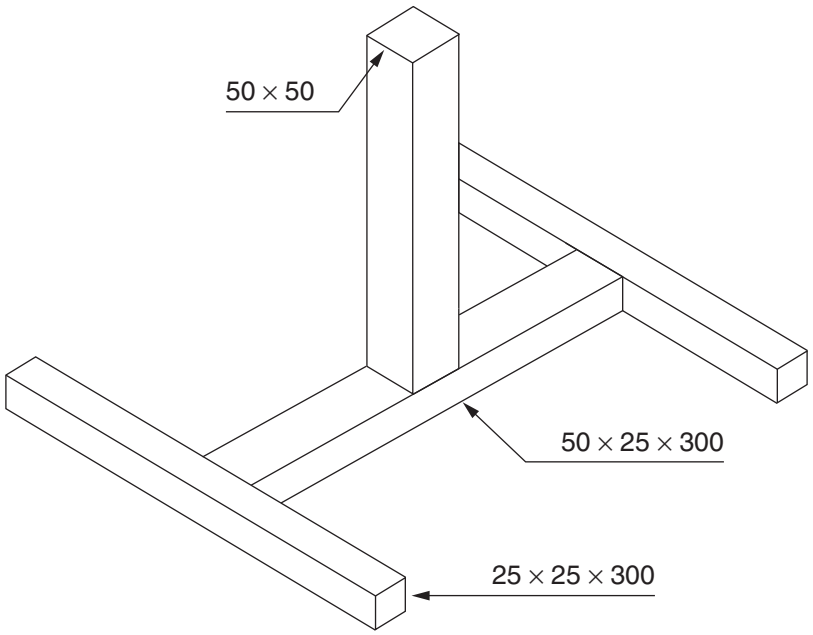
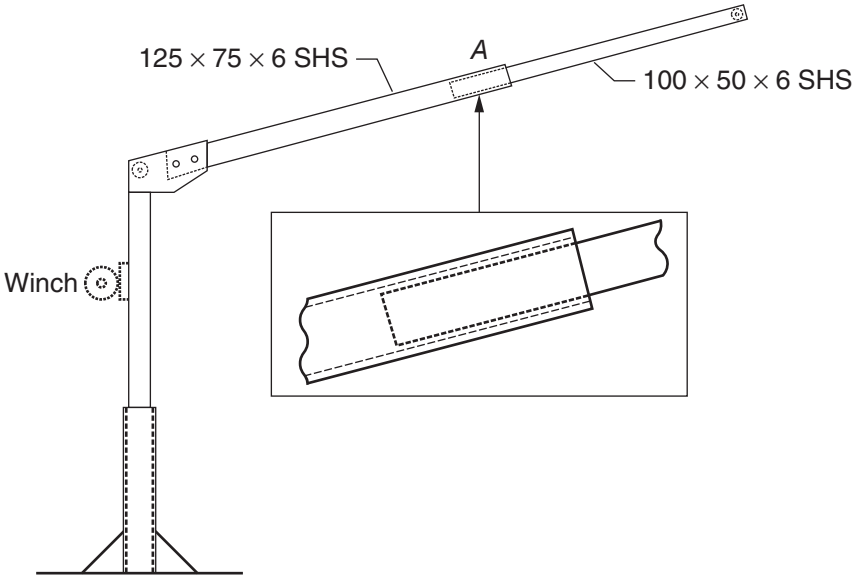
Question 13 (3 marks)

The components of the object shown need to be held together in order for them to be welded. With the aid of a labelled sketch, design a jig that would allow this to happen. **3**



Question 14 (7 marks)

Use the diagram of a davit (crane) below to answer parts (a) and (b).



(a) With the aid of a labelled sketch, design an adjustable method of extending and securing the arm of the davit at *A*. **3**

Question 14 continues on page 8

(b) Evaluate materials and surface finishes that could be used to manufacture the davit for the marine environment. **4**

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End of Question 14

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Section III

15 marks
Attempt Question 15
Allow about 35 minutes for this section

Answer the question in a writing booklet provided. Extra writing booklets are available.

Question 15 (15 marks)

A company is expanding its operations by establishing an interstate facility.

(a) Describe personnel issues the company needs to consider when staffing the new facility. **5**

(b) Analyse factors, other than personnel issues, that could affect the viability of the company at the new location. **10**

End of paper

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