BOARD OF STUDIES
NEW SOUTH WALES

Centre Number

Student Number

2002

HIGHER SCHOOL CERTIFICATE EXAMINATION

Industrial Technology
Metals and Engineering Industries

General Instructions

- Reading time – 5 minutes
- Working time – $1\frac{1}{2}$ hours
- Write using black or blue pen
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of this page and pages 5, 9, 13 and 17

Total marks – 100

Section I Pages 2–12

60 marks

- Attempt Questions 1–3
- Allow about 55 minutes for this section

Section II Pages 13–20

40 marks

- Attempt Questions 4–5
- Allow about 35 minutes for this section

Section I

60 marks
Attempt Questions 1–3
Allow about 55 minutes for this section

Answer the questions in the spaces provided.

Marks

Use the following information to answer Questions 1, 2 and 3.

I-Tech, a company operating in the metals and engineering industry, has been on the same site for a number of years. Owing to recent urban expansion and new Government legislation, the company reviews its current facilities, policies and practices.

Question 1 (20 marks)

(a) As a result of this review I-Tech needs to reduce its pollution levels.

(i) Identify TWO different forms of pollution that I-Tech might produce. **2**

.....

.....

.....

.....

(ii) How would the forms of pollution identified in part (a) (i) affect the local community? **2**

.....

.....

.....

.....

Question 1 continues on page 3

Marks

Question 1 (continued)

(b) I-Tech has decided to introduce an extensive recycling program.

(i) Identify the advantages and disadvantages of recycling for I-Tech. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(ii) Outline a suitable recycling program that I-Tech could introduce. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 1 continues on page 4

Question 1 (continued)

(c) I-Tech's review concluded that an Environmental Impact Statement (EIS) would need to be prepared. Discuss issues that would be included in the EIS. **8**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 1

Centre Number

Student Number

Section I (continued)

Marks

Question 2 (20 marks)

(a) Employees may be involved in the treatment of workplace injuries. What essential resources must I-Tech provide for this purpose? **2**

.....

.....

.....

.....

.....

.....

(b) What strategies could I-Tech implement to ensure the effective induction of new staff? **2**

.....

.....

.....

.....

.....

.....

Question 2 continues on page 6

Marks

Question 2 (continued)

(c) How could I-Tech ensure that Equal Employment Opportunity (EEO) principles are followed in the company? **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 2 continues on page 7

Marks

Question 2 (continued)

(d) Describe the possible role of unions as I-Tech considers changes to its workplace policies and practices. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 2 continues on page 8

Marks

Question 2 (continued)

(e) There are many issues involved in the reorganisation of I-Tech's operations. Discuss the implications of improved materials and technologies on environmental, and occupational health and safety (OHS) issues. **8**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 2

Marks

Question 3 (20 marks)

A worker has sustained a back injury while lifting a steel beam, resulting in admission to the local hospital. As a result of this accident, I-Tech's OHS committee is to review current work practices.

(a) Outline the procedures that the OHS committee would use to obtain information for this review. **4**

.....

.....

.....

.....

.....

.....

.....

.....

(b) As a result of the review, the OHS committee needs to prepare and present a report for management. Outline the use of computer software in the preparation and presentation of this report. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 3 continues on page 10

Marks

Question 3 (continued)

(c) Design a wall chart, incorporating text and graphics, that could be used to inform all employees of the procedure to follow should they witness a workplace accident. Use the spaces provided. **8**

WALL CHART

Question 3 continues on page 11

Question 3 (continued)

Working space for part (c) if required.

Question 3 continues on page 12

Marks

Question 3 (continued)

(d) How should I-Tech's management inform all employees about the OHS committee's recommendations regarding the new work practices? **2**

.....

.....

.....

.....

.....

.....

(e) During the past year, FOUR accidents have occurred resulting in losses to the company. These losses are detailed in the table. **2**

Complete the table and calculate the average cost to the company per accident.

Item	*Number*	*Cost*	*Total*
Ambulance fees	3	$136.00	
Days lost	23	$111.00	
Hire of temporary staff	15	$130.00	
Visits to doctor	5	$45.00	
	Total cost		

Average cost to the company per accident $.....

End of Question 3

2002 HIGHER SCHOOL CERTIFICATE EXAMINATION

Industrial Technology
Metals and Engineering Industries

Centre Number

Student Number

Section II

40 marks
Attempt Questions 4–5
Allow about 35 minutes for this section

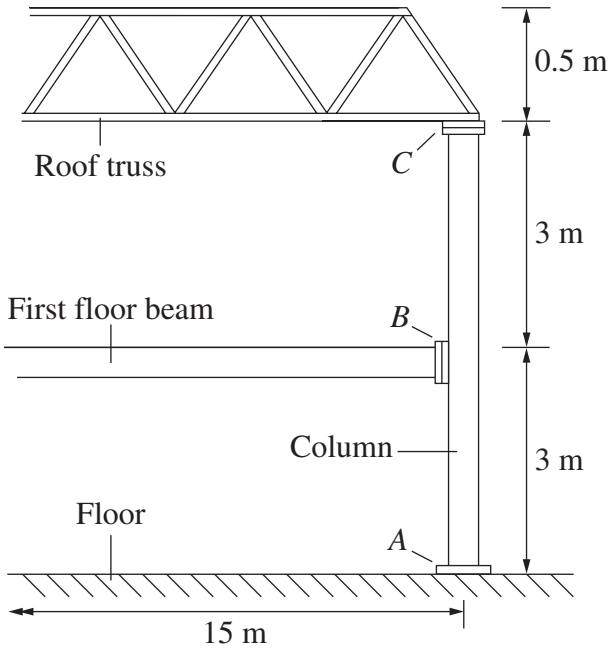
Answer the questions in the spaces provided.

Marks

Question 4 (20 marks)

Use the information and diagram below to answer parts (a)–(e).

Part of the frame for a two-storey factory building is shown in the diagram. The components are to be manufactured in such a way that they can be pre-fabricated and assembled on site. The roof truss is a light steel fabrication.



NOT TO SCALE

(a) Name a suitable type of beam that could be used for the first floor. **1**

.....

Question 4 continues on page 14

Question 4 (continued)

(b) The beams, columns and trusses in the building need to be protected against corrosion. Name and describe TWO suitable finishing methods that could be applied to these components. **3**

.....

.....

.....

.....

.....

.....

.....

.....

(c) The building is to be clad with a metal sheet. Name a suitable material for this purpose, and describe a method of fixing the metal sheet to the frame. **3**

.....

.....

.....

.....

.....

.....

.....

.....

Question 4 continues on page 15

Question 4 (continued)

(d) Describe, with the aid of sketches, how the joints *A*, *B* and *C* can be designed to allow for pre-fabrication and reassembly. **5**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

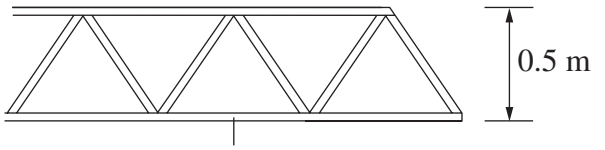
.....

Question 4 continues on page 16

Marks

Question 4 (continued)

(e) The fabricated roof truss is manufactured from hollow square tube $75 \times 50 \times 6$. It is to be manufactured in a fabrication factory prior to delivery to the site. **8**



NOT TO SCALE

Roof truss

Describe how the materials for this truss can be cut accurately, prepared for fabrication, set up and fabricated ready for use.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of Question 4

Industrial Technology
Metals and Engineering Industries

Centre Number

Student Number

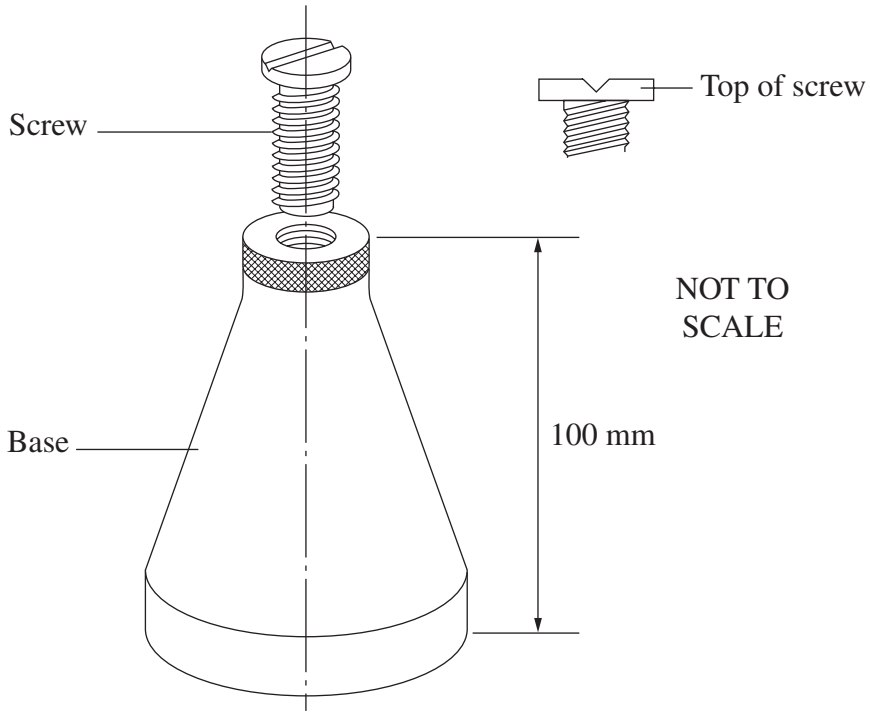
Section II (continued)

Marks

Question 5 (20 marks)

Use the information below to answer parts (a)–(d).

The sketch shows a small screw-jack used by machinists to support work on a machine table. The base is made from bright mild-steel bar and the screw from medium carbon steel.



(a) What machining process would be used to produce the pattern on the top of the base? **1**

.....

.....

Question 5 continues on page 18

Marks

Question 5 (continued)

(b) Describe, using sketches, how you would set up the base material in a lathe and cut the external taper from bright mild-steel bar. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) A vee-slot is machined in the top of the screw to support round bars. Describe a method of holding the screw and machining the slot. **3**

.....

.....

.....

.....

.....

.....

.....

.....

Question 5 continues on page 19

Question 5 (continued)

(d) The screw of the machine jack is to have its properties modified to prevent excessive wear with use. Name a suitable process that could be used, and describe how this process would be carried out in an industrial setting. **4**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Question 5 continues on page 20

Question 5 (continued)

(e) Shaping, milling and surface grinding are methods of producing flat surfaces on machined components. Briefly describe each process, and compare them in terms of time taken and accuracy of surface produced. **8**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

End of paper