BOARD OF STUDIES
NEW SOUTH WALES

STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

1999

INDUSTRIAL TECHNOLOGY

2 UNIT
SECTION II
AUTOMOTIVE INDUSTRIES

OPTION—ENGINE

Total time allowed for Sections I and II—One hour and a half
(Plus 5 minutes reading time)

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Where appropriate, show all working for solutions neatly and clearly.
- You may use Board-approved drawing instruments and calculators.

Section II—Engine (15 marks)

- Question 4 is COMPULSORY.
- Attempt TWO questions from Questions 5, 6 and 7.
- Answer the questions in the spaces provided in this paper.

MARKER'S USE ONLY

Question				
4				
5				
6				
7				

SECTION II—ENGINE OPTION

(15 Marks)

QUESTION 4 This question is COMPULSORY. (5 marks)

(a) The nearside rear of a small sedan is damaged in an accident. The repairer's quotation is presented below. Assess the total cost of the repair if mechanical labour is charged out at $43/h and the painter is paid at $45/h.

Action	*Hours*	*Costs*
Remove and replace		
Rear bar assembly	1·0	.....
Tail lamp assembly	0·5	.....
Repair		
Nearside guard	3·0	.....
Rear beaver panel	1·0	.....
Rear bar mounting bracket	0·5	.....
Prepare and respray damaged body panels	4·0	.....
Supply new		
Rear bar	.....	$250
Rear tail lamp assembly	.....	$135

Total cost $ .....

QUESTION 4 (Continued)

(b) An exploded pictorial drawing of a brake cable connecting piece is given in Figure 1. Using the information given, draw an assembled view in the direction of the arrow **P** to a scale of 2 : 1.

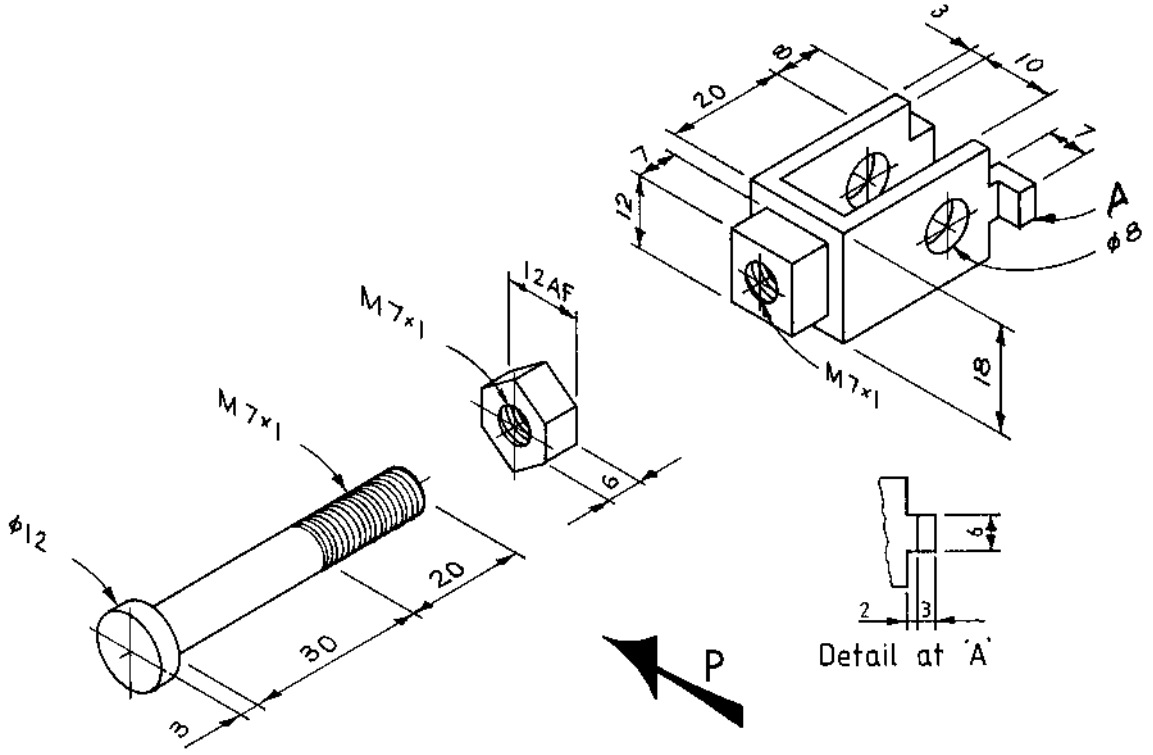
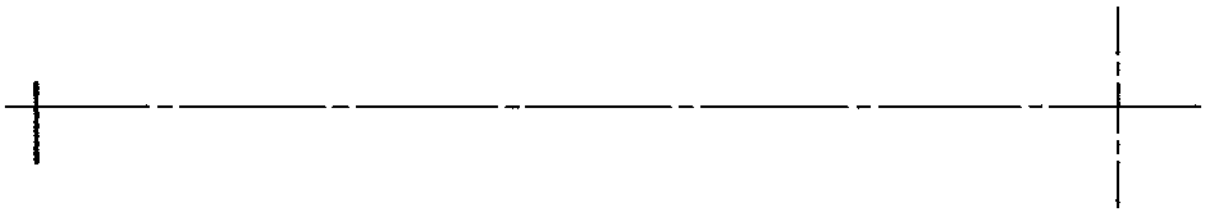


FIG. 1



SCALE 2:1

Question 4 continues on page 4

QUESTION 4 (Continued)

(c) The table below shows a number of standard symbols commonly found in automotive drawings. Give the interpretation of the symbol in the space provided.

Symbol	*Interpretation*
∅	
M20 × 2·5	
∅ 12·5 ± 0·1	

(d) Describe TWO advantages and TWO disadvantages of electric and pneumatic power tools used in automotive workshops.

	Electric power tools	*Pneumatic power tools*
Advantage 1		
Advantage 2		
Disadvantage 1		
Disadvantage 2		

(e) Describe the purpose of the Australian Design Rules for the automotive industry.

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Attempt TWO questions from Questions 5, 6 and 7.

QUESTION 5 (5 marks)

(a) (i) Every automobile manufacturer specifies a routine maintenance schedule for new vehicles. Explain why the maintenance schedule is more frequent while the vehicle is new.

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(ii) List the FOUR stages of the four-stroke internal combustion engine cycle.

1 .....

2 .....

3 .....

4 .....

Question 5 continues on page 6

QUESTION 5 (Continued)

(b) (i) The diagram below shows the cross-section of a rotary engine.

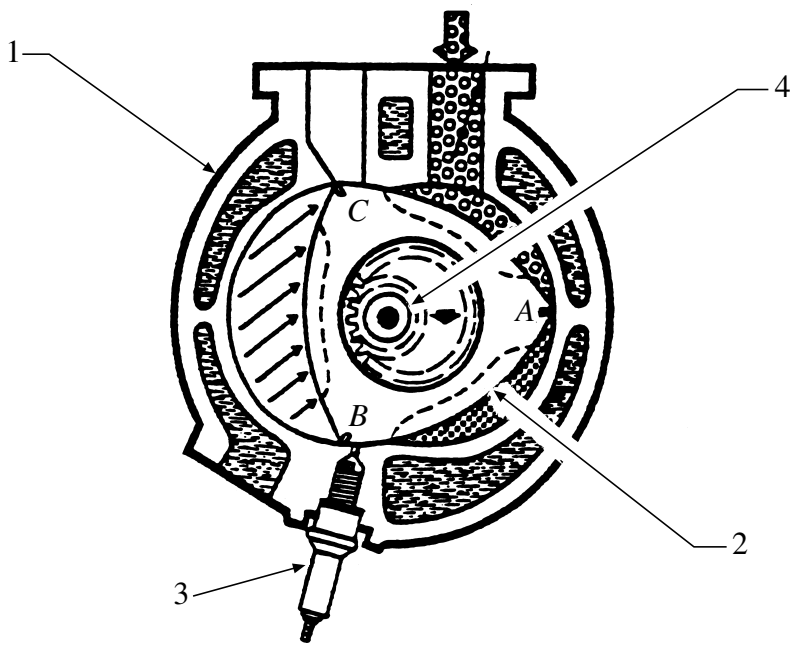

FIG. 2

Explain the function of component *B* and the components labelled 1–4 in Figure 2.

Component *B* .....

.....

Component 1 .....

.....

Component 2 .....

.....

Component 3 .....

.....

Component 4 .....

.....

(ii) Indicate whether this type of engine operates on 'two-stroke' or 'four-stroke' cycle. Name the stage in that cycle shown between *A* and *C*.

Cycle .....

Stage .....

QUESTION 5 (Continued)

(c) Exhaust emission may be used as a diagnostic tool. Explain what may be the cause of the following in a small turbo-charged diesel engine.

(i) White smoke

.....

.....

(ii) Black particulate smoke

.....

.....

(iii) Black smoke

.....

.....

Please turn over

QUESTION 6 (5 marks)

(a) Oils are used in vehicles to reduce friction and reduce corrosion.

(i) What is meant by the term *viscosity*?

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(ii) Why do manufacturers recommend differing viscosities for summer and winter use?

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(b) (i) Why is synthetic oil recommended for high performance engines?

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(ii) What is meant by the terms:

1 *friction modified*?

.....

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.....

2 *detergents*?

.....

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QUESTION 6 (Continued)

A small four-cylinder, four-stroke engine has a burnt exhaust valve in one cylinder.

(c) (i) Describe how you would diagnose this fault. Indicate the tools/equipment you would use and the result of your testing.

Tools/equipment .....

.....

Result of tests .....

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.....

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(ii) To rectify this problem, the cylinder head must be removed. List the steps required to do this.

1 .....

2 .....

3 .....

4 .....

5 .....

6 .....

(iii) Removal of the cylinder head reveals a badly burnt valve, but only minor damage to the valve seat.

Describe how you would repair this situation.

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Question 6 continues on page 10

QUESTION 6 (Continued)

(d) Describe the process of replacing the cylinder head using a new cylinder head gasket. Indicate the precautions that need to be taken in placing the gasket and tightening the head.

(i) Process .....

.....

.....

(ii) Precautions—new gasket .....

.....

.....

(iii) Precautions—tightening head .....

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.....

(e) Name the correct tool that is used to tighten the cylinder head nuts.

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QUESTION 7 (5 marks)

(a) (i) Name and describe THREE areas of regular preventative maintenance on a vehicle.

Name 1 .....

Description .....

.....

.....

Name 2 .....

Description .....

.....

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Name 3 .....

Description .....

.....

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(ii) Select ONE of these areas and describe in detail the program of maintenance that would be necessary to keep the vehicle in running order.

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Question 7 continues on page 12

QUESTION 7 (Continued)

(b) Explain why multivalve engines are used in modern vehicles.

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(c) Describe what is meant by the term *thermosyphon* .

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(d) (i) Name ONE type of fuel pump used in motor vehicles and describe how it works.

Name .....

Operation .....

.....

.....

(ii) Describe the typical symptoms that you will notice when an engine fuel pump is faulty, but still working at reduced capacity.

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QUESTION 7 (Continued)

(e) Explain why it is necessary to ensure that there are no leaks in the exhaust system.

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(f) A car engine is overheating intermittently. A compression test shows that all external hoses are in good condition.

(i) Identify a possible cause of the overheating.

Cause .....

(ii) Explain how the problem could be overcome.

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