VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2007

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET ENGINEERING STUDIES CERTIFICATE III

Written examination

Wednesday 21 November 2007

Reading time: 9.00 am to 9.15 am (15 minutes)
Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	15	15	15
B	4	4	15
C	18	18	30
D	4	4	40
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, a protractor, a set square and aids for curve sketching.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.
- A scientific calculator is allowed in this examination.

Materials supplied
- Question and answer book of 24 pages with a formula sheet on page 24.
- Answer sheet for multiple-choice questions.

Instructions
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – VBN 771 Apply electrotechnology principles in an engineering environment

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answers** the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be given if more than one answer is completed for any question.

Question 1
The ohm is the unit for electrical
A. conductance.
B. amperage.
C. voltage.
D. resistance.

Question 2
A battery is designed to provide a source of electrical
A. resistance.
B. pressure.
C. opposition.
D. displacement.

Question 3
An electric motor rotates due to the
A. magnetic effect of current.
B. heating effect of current.
C. chemical effect of current.
D. physiological effect of current.

Question 4
The most suitable application for piezo electric devices would be for
A. voltage amplifiers.
B. gas ignition systems.
C. battery chargers used in remote areas.
D. measuring high temperatures.

Question 5
A solar cell converts
A. radiant energy to electrical energy.
B. chemical energy to electrical energy.
C. electrical energy to radiant energy.
D. mechanical energy to electrical energy.

Question 6

A capacitor is a device which is capable of storing an electric

A. voltage.
B. resistance.
C. charge.
D. current.

Question 7

Devices that rely on magnetism for their operation are

A. relays and resistors.
B. resistors and capacitors.
C. capacitors and transformers.
D. transformers and relays.

Question 8

A power resistor has 6R8 stamped on its body.
This indicates a resistance of

A. 0.68 Ω
B. 6.8 Ω
C. 68 Ω
D. 680 Ω

Question 9

A 4.7 kΩ resistor has tolerance of 10%.
Its acceptable resistance range is from

A. 4230 to 5170 Ω
B. 4465 to 4935 Ω
C. 3760 to 5640 Ω
D. 4000 to 5400 Ω

Question 10

Power used in an electrical circuit is measured in

A. volts.
B. watts.
C. amps.
D. ohms.

Question 11

Power in a live DC circuit can be determined by combining the readings from two separate instruments.
These are the

A. voltmeter and wattmeter.
B. ammeter and wattmeter.
C. ohmmeter and voltmeter.
D. ammeter and voltmeter.

Question 12

A voltmeter is always placed

A. in series with electrical components.

B. in parallel with electrical components.

C. so that total electric current flows through it.

D. in series with power-consuming devices.

Question 13

A low resistance in a circuit will cause

A. a high voltage drop.

B. a low current.

C. a high current.

D. the current to fall to zero.

Question 14

Excessive current in a circuit will cause a fuse to

A. open.

B. short.

C. reverse polarity.

D. conduct to earth.

Question 15

A circuit breaker is a switch that operates automatically when

A. normal rated current flows.

B. circuit current is less than the set rating of the circuit breaker.

C. circuit current is greater than the set rating of the circuit breaker.

D. an open circuit condition occurs.

END OF SECTION A

SECTION B – VBN 773 Produce engineering sketches and drawings

Instructions for Section B

Answer **all** questions in the spaces provided. All dimensions are in mm (millimetres).

Question 1

Figure 1 shows two views of an object. **Complete and label** view 2 to show a full-sectioned view of A–A.
Note: Both holes go all the way through and are parallel.

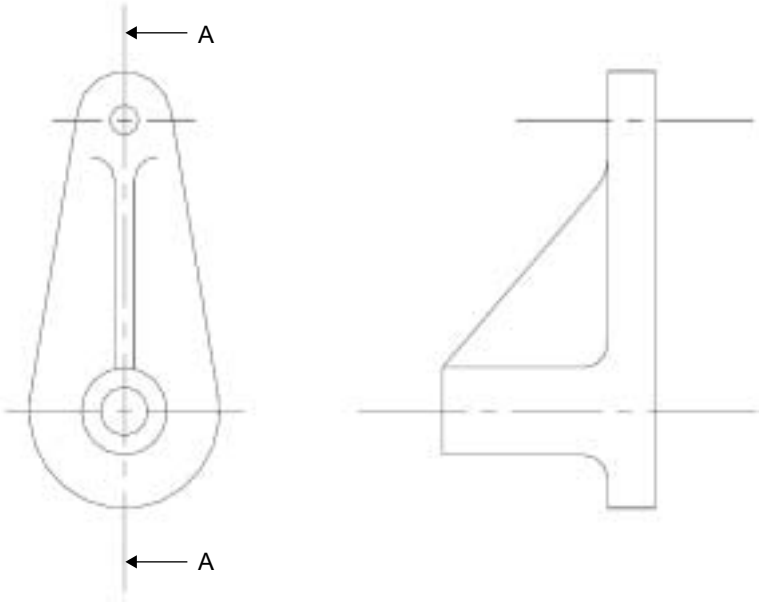
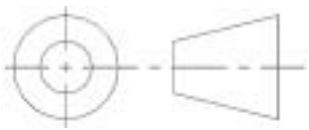


Figure 1

3 marks

Question 2

What does the symbol below mean?



_____

1 mark

Figure 2 is an isometric drawing of a baseplate. Use this drawing to answer the questions which follow.

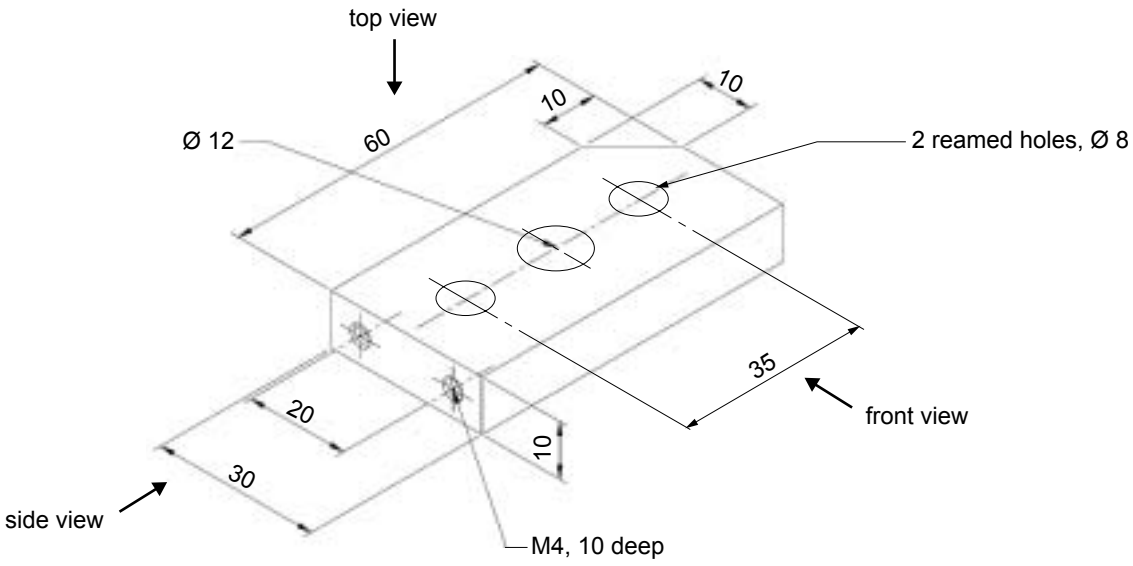


Figure 2. Baseplate

Question 3

a. What size thread is used for the two tapped holes shown in Figure 2?

_____

1 mark

b. If the general tolerance for length for this drawing is ±0.25, what would be the maximum and minimum length you could machine the **baseplate**?

maximum _____ minimum _____

2 marks

c. Prior to **hand reaming** the holes, what size drill would you use?

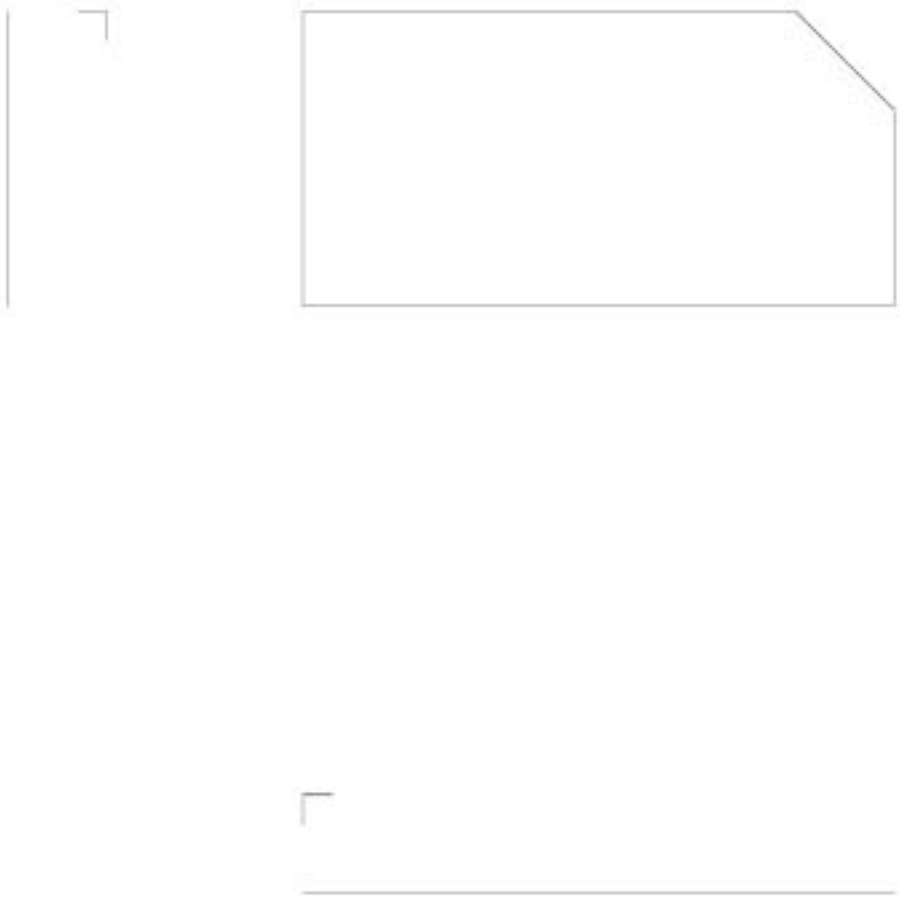
_____

1 mark

Question 4

Below is the beginning of an orthogonal drawing of the baseplate shown in Figure 2. Complete the orthogonal drawing showing the **top**, **front** and **side** views in third-angle projection.

- The drawing is not to scale.
- Use conventional orthogonal drawing systems.
- All dimensions must be shown.



7 marks

Total 15 marks

END OF SECTION B
TURN OVER

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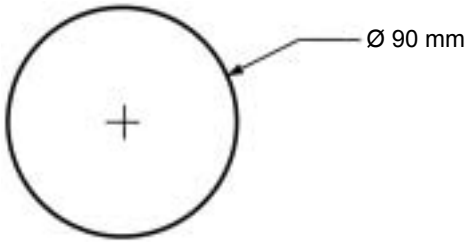
SECTION C – VBN 787 Apply mathematical principles to engineering designs

Instructions for Section C

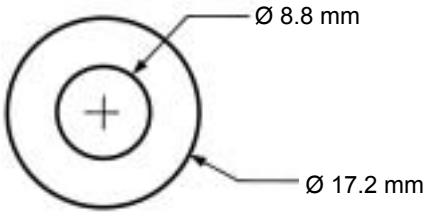
Answer **all** questions in the spaces provided.
Where a question is worth more than one mark, you **must** show your working out.
All answers must include appropriate units.
All dimensions are in mm (millimetres).

Question 1
Calculate the area of the circle shown. (Answer to two decimal places.)



1 mark

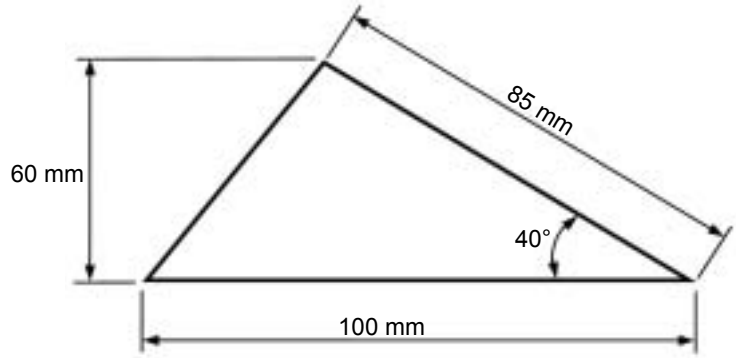
Question 2
Calculate the area of the washer (annulus) shown. (Answer to two decimal places.)



2 marks

Question 3

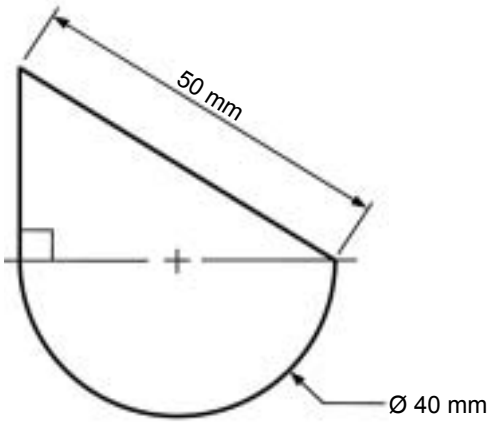
Calculate the area of the triangle. (Answer to two decimal places.)



1 mark

Question 4

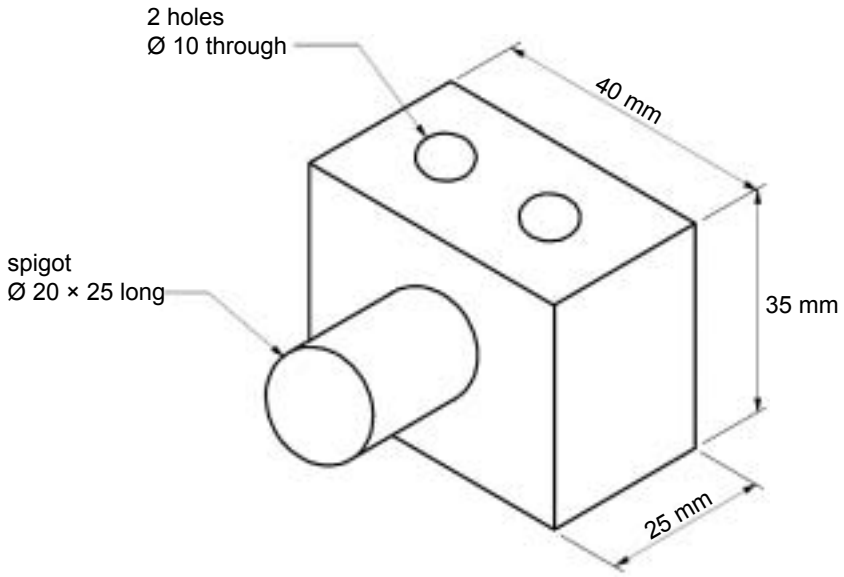
Calculate the perimeter of the figure shown. (Answer to two decimal places.)



2 marks

Question 5

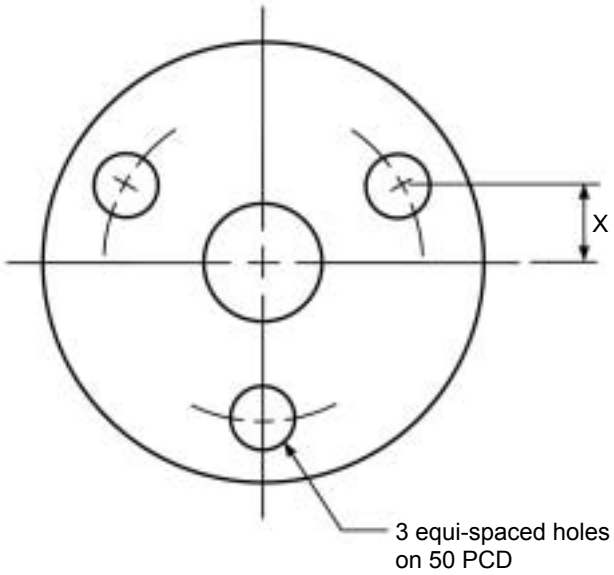
Calculate the volume of the figure shown. (Answer to two decimal places.)



5 marks

Question 6

Calculate the distance, X, shown on the drawing below. (Answer to two decimal places.)



2 marks

Question 7

A nut having an M14 × 2.0 single start thread is turned $\frac{1}{4}$ of a turn. How far will it advance along the bolt?

1 mark

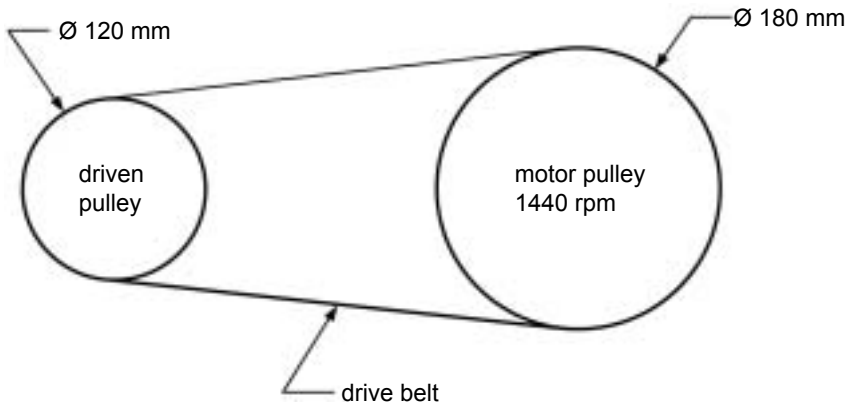
Question 8

A machine vice is advertised at $638 less 15% for cash. Calculate the cash sale price.

1 mark

Question 9

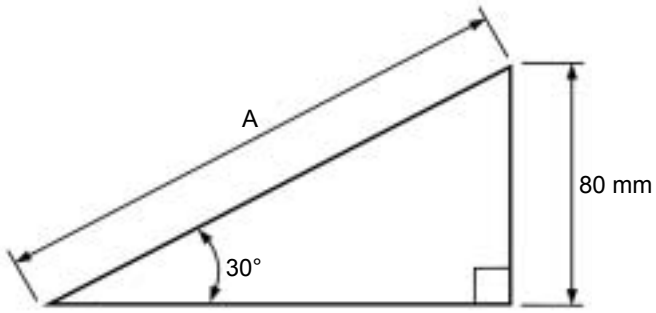
Calculate the rpm of the driven pulley shown. (Answer to two decimal places.)



2 marks

Question 10

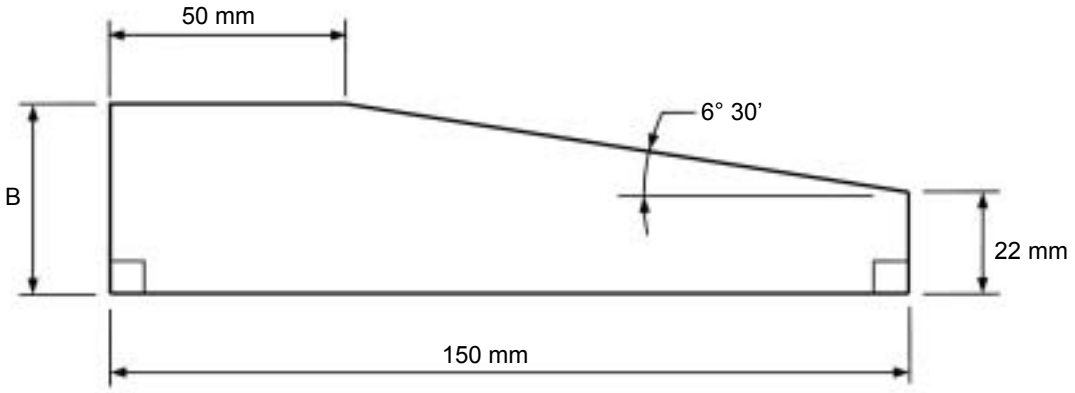
Calculate the length of side A. (Answer to two decimal places.)



1 mark

Question 11

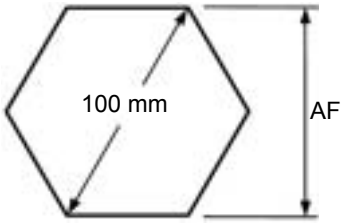
Calculate the height B of the block shown. (Answer to two decimal places.)



2 marks

Question 12

Calculate the **spanner size** AF (Across Flats) required for the hexagon bar shown. (Answer to the nearest whole number.)



2 marks

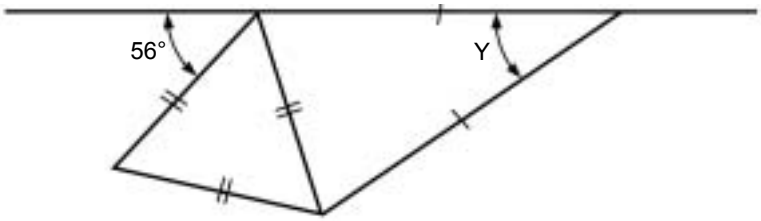
Question 13

Calculate the cost of running a 7.5 kW electric motor for 6 hours if the cost of electricity is 12 cents per kW/h. (Answer to be given in dollars and cents.)

1 mark

Question 14

How many degrees is angle Y?



1 mark

Question 15

Evaluate the following to two decimal places.

$$\frac{15.2 \times \pi}{2.9 \times 5.7}$$

1 mark

Question 16

Lead has a density of 11 000 kg/m^3

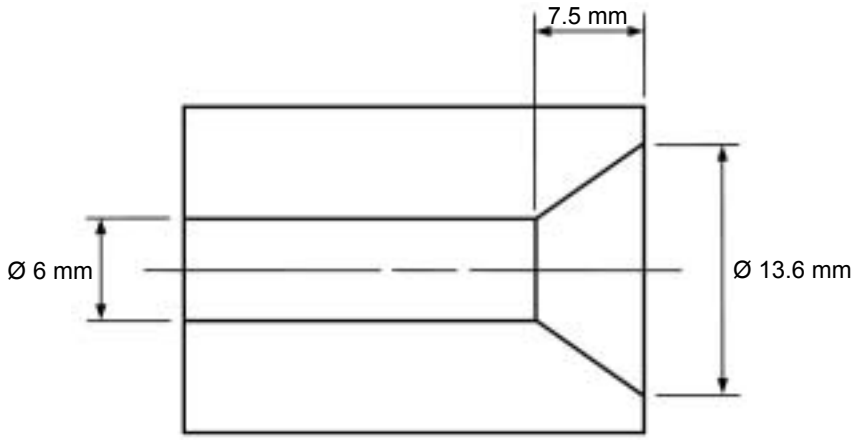
Aluminium has a density of 2 600 kg/m^3

What percentage of the density of lead is aluminium? (Answer to two decimal places.)

1 mark

Question 17

Calculate the **included** angle in degrees and minutes from the drawing below.



2 marks

Question 18

Convert the following imperial sizes to metric.

(1 inch = 25.4 mm)

Give answers to three decimal places.

i. $\frac{11''}{64}$

ii. $1\frac{7''}{16}$

2 marks

Total 30 marks

END OF SECTION C

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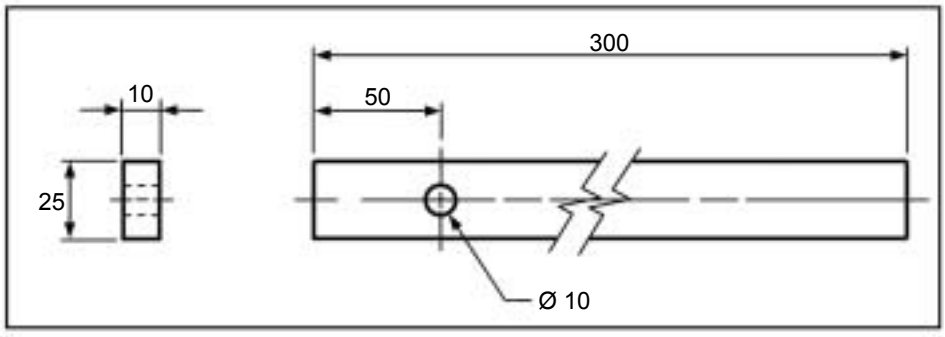
SECTION D – VBN 788 Design and prototype components and/or small structures using engineering design principles

Instructions for Section D

Answer **all** questions in the spaces provided. All dimensions are in mm (millimetres).

The drawing below shows an aluminium product which needs a Ø 10 mm hole drilled.

In a production situation, a drilling fixture would be used to accurately position and clamp each product to drill the hole without the need for marking out.



You are required to design a drilling fixture for a production situation that enables the operator to drill the Ø 10 mm hole.

Your design must include the following features.

- accurate positioning of the product
- suitable clamping of the product
- suitable clamping of base to the drill table (G clamps are **not** to be used)
- easy swarf removal
- easy (quick) to load and unload product

You have access to a full range of bar stock to use in your design.

The bar stock includes

- round bright and black mild steel, 6 mm to 50 mm diameter
- square bright and black mild steel, 6 mm to 25 mm
- rectangular bright mild steel, 6 mm to 25 mm thick, and 40 mm, 50 mm, 70 mm and 80 mm widths
- steel plate, 6 mm to 25 mm thick.

You may use standard items such as screws, bolts and nuts as required.

Question 1

Sketch a detailed assembly drawing (2D), showing **two** views of the required drilling fixture, in the space below. Label all parts. Show basic dimensions.

15 marks

Question 2

Select **two main parts** from the sketch of the drilling fixture and complete the table below to create a material cutting list.

Cutting list

Part name	Material type	Raw material size	Raw material length	Number required

4 marks

Question 3

Select **one main part** of the drilling fixture and describe how it would be manufactured using the operational plan below. Use N/A (Not Applicable) where you think a certain box is not required for an operation.

Part name _____

Op. No.	Operation description	Type of machine	Work holding method	Equipment/Cutters

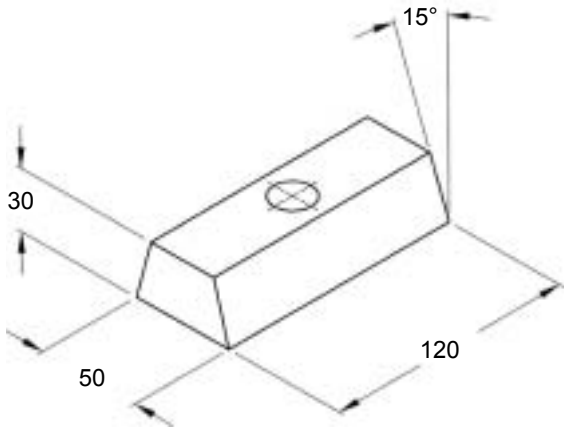
10 marks

Question 4

A hole is to be drilled and reamed square to the base of the brass block shown below.

The two long sides are inclined at an angle of 15 degrees to the base.

The vice which is available to hold the block has a maximum opening distance of 110 mm.



a. State two reasons why clamping the block in a standard vice is unsuitable.

1. _____

_____

_____

2. _____

_____

_____

2 marks

The vice that will be used to hold the brass block has a solid base.

b. What will happen if the block is drilled while being held directly in the vice?

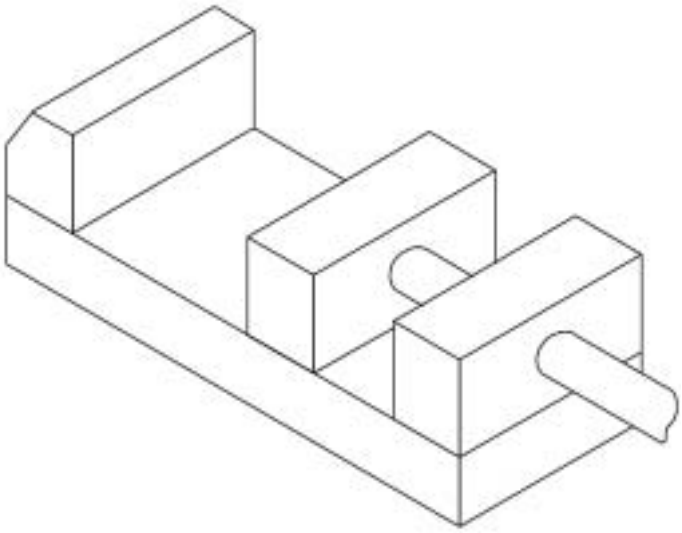
_____

_____

1 mark

c. Using the sketch of the vice below, design and draw in jaw inserts that will hold the brass block securely and overcome the problems identified in **Questions 4a. and 4b.**

Your design needs to include a way to **quickly** attach and detach the jaw inserts **without** using screws or bolts. (You may write some brief notes to explain your design if required.)



8 marks

Total 40 marks

END OF SECTION D
TURN OVER

Data/formula sheet

Circumference of a circle = πD

Area of a circle = πr^2

Area of a triangle = ½ × base × height

Volume of a sphere = $\frac{4 \pi r^3}{3}$

Area of a rectangle = L × W

Volume of a square prism = L × W × H

Area of a circular ring = $\frac{\pi (D^2 - d^2)}{4}$

Volume of a cylinder = $\pi r^2 \times L$

Sin = $\frac{\text{opposite}}{\text{hypotenuse}}$

Cos = $\frac{\text{adjacent}}{\text{hypotenuse}}$

Tan = $\frac{\text{opposite}}{\text{adjacent}}$

END OF QUESTION AND ANSWER BOOK