

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

Opposition to electric current is called

- A. conductance.
- B. amperage.
- C. voltage.
- D. resistance.

Question 2

A battery is **not** designed to provide a source of electrical

- A. current.
- B. power.
- C. resistance.
- D. voltage.

Question 3

Current passing through a copper conductor will cause a

- A. magnetic field around the conductor.
- B. chemical reaction within the conductor.
- C. decrease in conductor temperature.
- D. reduction in conductor resistance.

Question 4

The most suitable application for a small solar cell array would be

- A. a power source for a domestic oven.
- B. an Uninterruptable Power Supply (UPS) in hospitals.
- C. a battery charger for use in remote areas.
- D. a device for measuring high temperatures.

Question 5

An alternator 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. current.
- B. resistance.
- C. voltage.
- D. charge.

Question 7

An inductor opposes change in electrical

- A. current.
- B. resistance.
- C. voltage.
- D. displacement.

Question 8

A power resistor has 68R 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 2.2 k ohm resistor has tolerance of 10%.

Its acceptable resistance range is from

- A. 1100 to 3300 Ω .
- B. 1980 to 2420 Ω .
- C. 2090 to 2310 Ω .
- D. 2178 to 2222 Ω .

Question 10

A watt is the unit for electrical

- A. resistance.
- B. voltage.
- C. current.
- D. power.

Question 11

Rotation in an electric motor is caused by the

- A. magnetic effect of the current.
- B. chemical effect of the current.
- C. heating effect of the current.
- D. physiological effect of the current.

Question 12

An ammeter is always inserted

- A. in series with electrical components.
- B. in parallel with electrical components.
- C. across the power supply.
- D. across the power-consuming devices.

Question 13

The fusible element of a HRC fuse is usually made from

- A. steel.
- B. copper/silver.
- C. nicrome.
- D. lead.

Question 14

A fuse 'blows' because

- A. excessive current melts a fusible element.
- B. excessive current short-circuits a fusible element.
- C. normal rated current melts a fusible element.
- D. normal rated current short-circuits a fusible element.

Question 15

The function of a diode is to

- A. prevent forward current flow.
- B. prevent reverse current flow.
- C. provide forward bias in a circuit.
- D. provide reverse bias in a circuit.

SECTION B – VBN 773 Produce engineering sketches and drawings

Instructions for Section B

Answer **all** questions in the spaces provided.

Question 1

Sketch a simple shaft with a hole in one end. You **must** include and label the following line types.








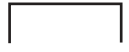
- dimension line
- centre line
- hidden line

1 + 3 = 4 marks

Question 2

In the diagram below some of the drawing symbols are identified by name, the others are blank. Select the name from the list which follows and place it below the appropriate blank symbol.

- J weld
- bead
- square
- fillet

							
_____	_____	_____	vee	bevel	u	_____	plug slot

4 marks

Question 3

Below is an exploded isometric drawing of a striker unit. You are required to sketch a **fully sectioned, front view** assembly drawing of the parts shown below. The sketch should be from view A.

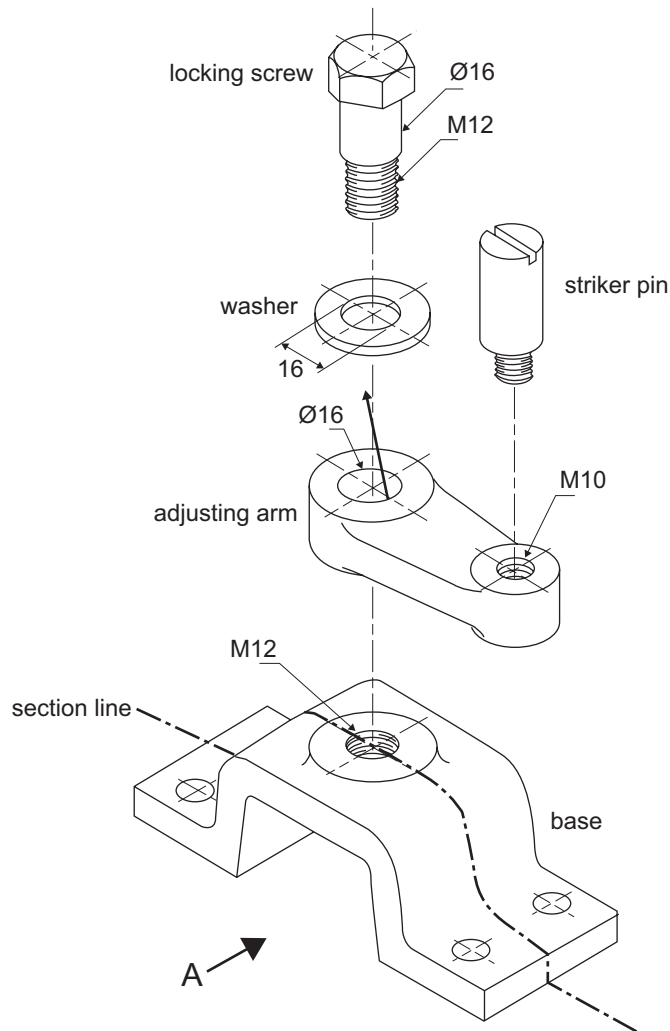
You **must** use the base as drawn on page 7 as the start of your sketch.

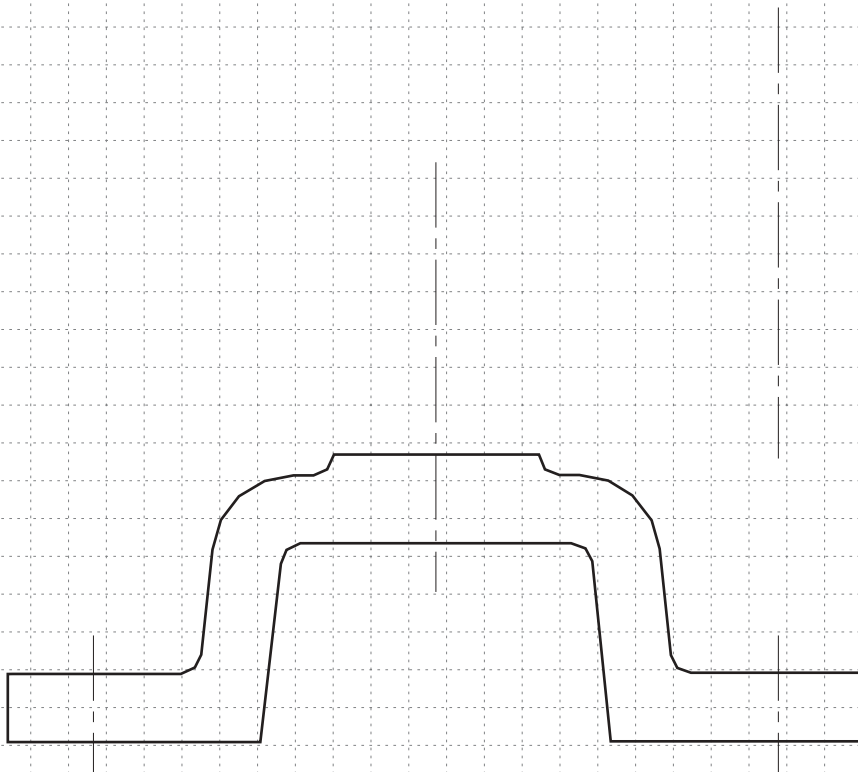
Your sketch must be as viewed from the direction labelled A on the isometric drawing.

Use conventional orthogonal drawing systems.

Draw to proportioned scaling.

Use the centre lines to assist in completing your task.





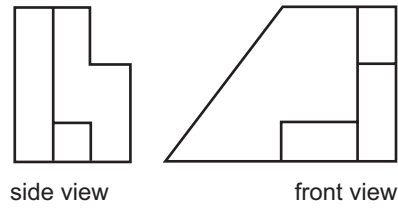
ITEM

1	BASE	1	C.I.
2	ADJUSTING ARM	1	C.I.
3	LOCKING SCREW	1	M.S.
4	STRIKER PIN	1	M.S.
5	WASHER	1	M.S.
	DESCRIPTION	QTY.	MAT'L
	STRIKER UNIT		

5 marks

SECTION B – continued
TURN OVER

Question 4



A component has been drawn using 3rd-angle projection. The side view and front view of the component are shown above. From the options (A–X) below identify the top view **and** the pictorial view of the component.

Top view _____

Pictorial view _____

A. 	B. 	C. 	D.
E. 	F. 	G. 	H.
I. 	J. 	K. 	L.
M. 	N. 	O. 	P.
Q. 	R. 	S. 	T.
U. 	V. 	W. 	X.

2 marks

Total 15 marks

END OF SECTION B

SECTION C – VBN 776 Using basic engineering concepts to plan the manufacture of engineering components

Instructions for Section C

Answer **all** questions in the spaces provided.

The following drawing represents a vice. The main components of the vice are listed. The vice is used in the workshop for a variety of purposes including clamping and drilling. Your class is about to manufacture a vice. Different groups will manufacture different components of the vice and it will be assembled when all the components are completed.

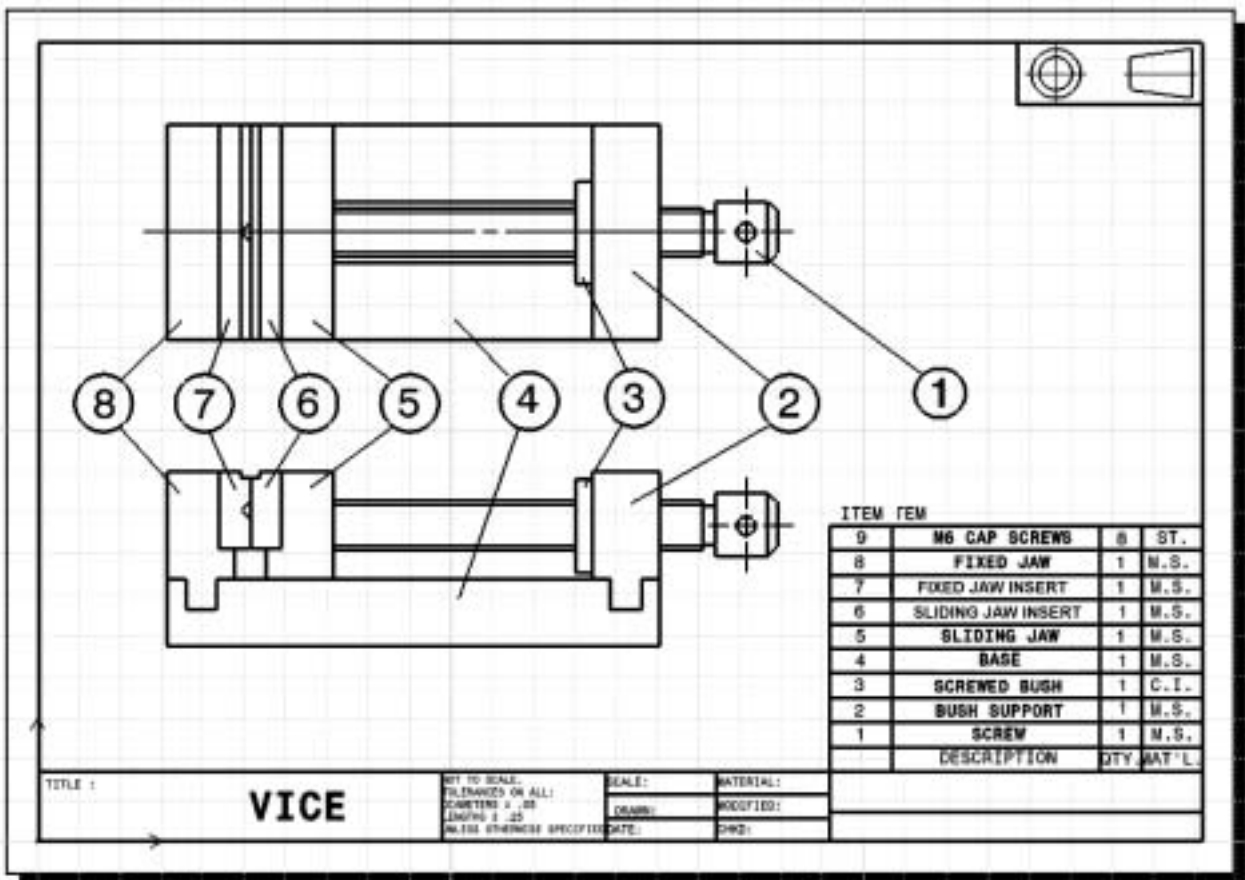


Figure 1

Question 1

Name the required material for the manufacture of the fixed jaw (Item 8 on Figure 1).

1 mark

Question 2

From Figure 1 identify the component that would be available commercially.

1 mark

Your group will be required to manufacture the **fixed jaw** (Item 8 on Figure 1) and the **screwed bush** (Item 3 on Figure 1).

Before you begin manufacturing these components of the vice you will need to carefully plan the manufacture. You will need to have a complete list of the operations, types of machine, work holding methods, equipment and types of cutters needed to complete the task. This planning will be done on an operational planning sheet. A copy of an operational planning sheet for each component follows.

The first component to be manufactured is the fixed jaw (Figure 2) which is shown below.

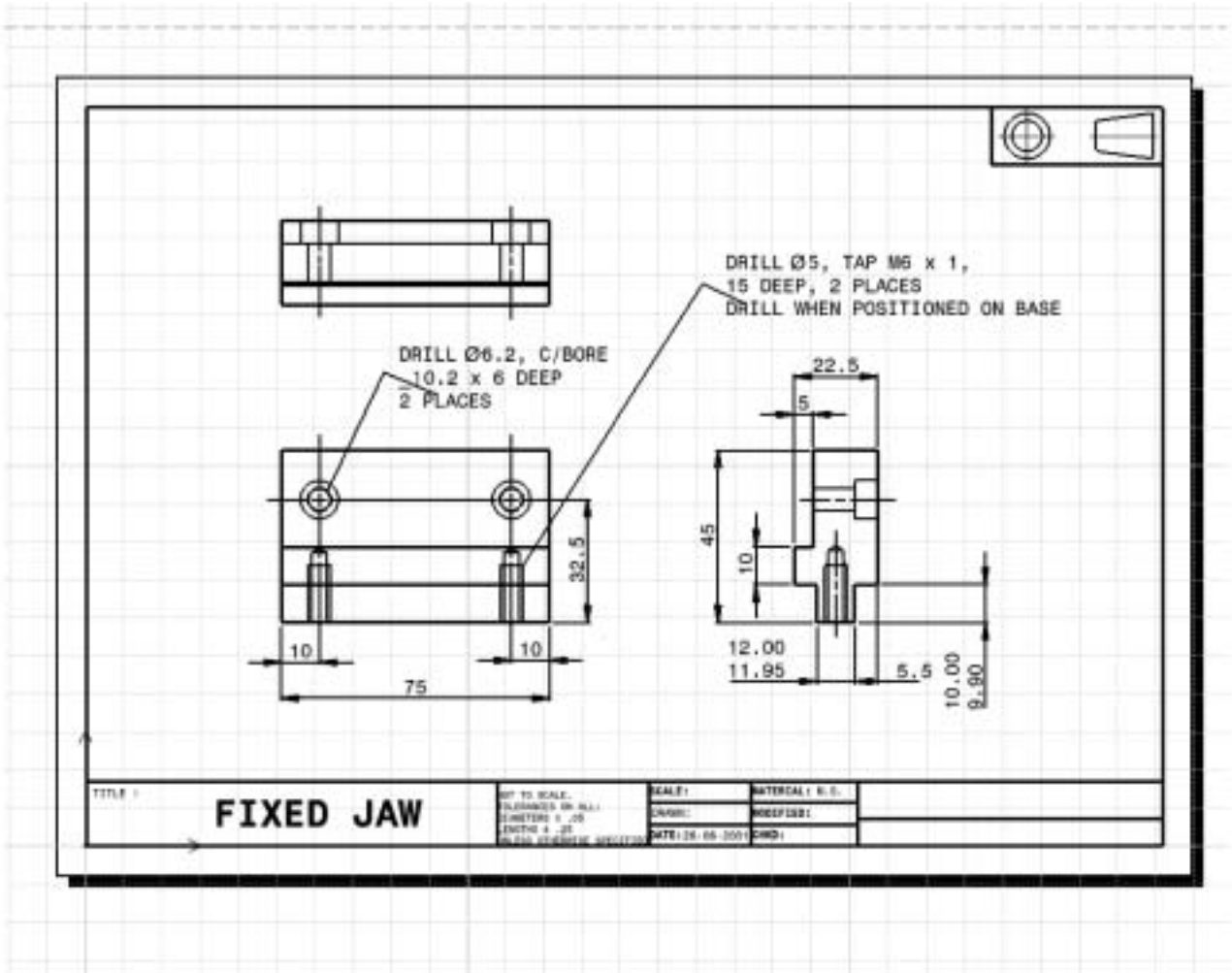


Figure 2

Question 3

Complete the operational planning sheet below for the **fixed jaw** (Figure 2) component of the vice. All of the operation descriptions are listed.

Part name: Fixed jaw							
Op. No.	Operation description	Type of machine	Work holding method	Equipment	Type of cutter		
1	Check size	NA*	Hand	Steel rule	NA*		
2	Clean and debur	NA*			NA*		
3	Mark out fixed jaw basic outline	NA*			NA*		
4	Set up machine vice and then mill jaw ends, and steps						
5	Mark out the drilled and tapped holes, and counter bore holes	NA*			NA*		
6	Drill and counter bore holes						
7	Tap holes	NA*					
8	Finish	NA*	Hand or Vice	File Emery cloth	NA*		

* NA = not applicable

6 marks

The next component your group will manufacture is the **screwed bush** (Item 3 in Figure 1) as shown in the detailed drawing (Figure 3) below.

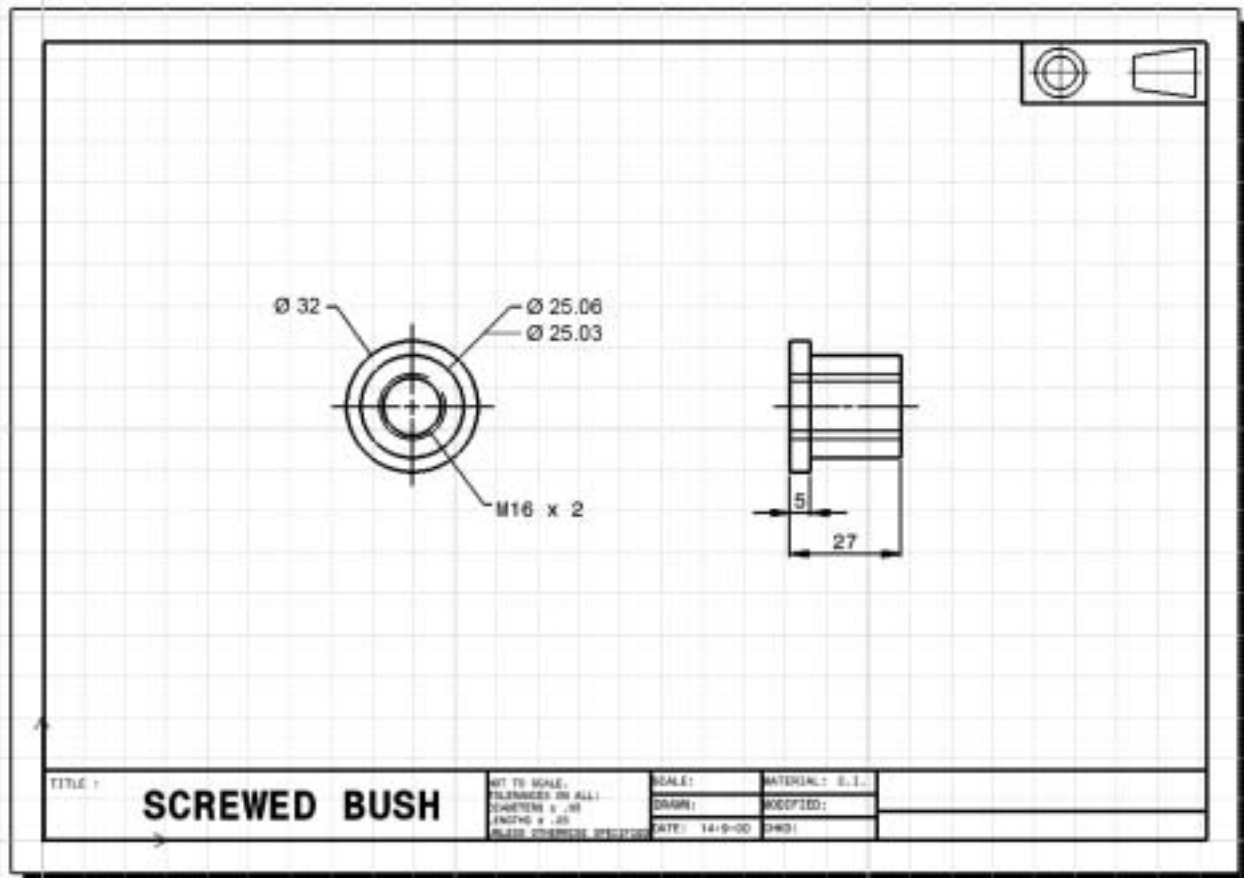


Figure 3

Question 4

The tolerance on the diameter of the screwed bush is 0.03 mm. What does the term 'tolerance' mean?

1 mark

Question 5

Complete the operational planning sheet below for the **screwed bush** (Figure 3) component of the vice. All of the operation descriptions are listed.

Part name: Screwed bush						
Op. No.	Operation description	Type of machine	Work holding method	Equipment	Type of cutter	
1	Check size	NA*	Hand	Steel rule	NA*	
2	Clean and debur	NA*	Vice	File	NA*	
3	Face and centre drill Drill centre hole					
4	Turn outside diameter 25.06 of the screwed bush					
5	Tap internal thread					
6	Turn 32 diameter					
7	Finish/Debur	NA*	NA*	File Emery cloth	NA*	

* NA = not applicable

4 marks

Question 6

Name **two** Occupational Health and Safety (OH&S) considerations that need to be identified before starting the manufacturing operations of the vice.

i. _____

ii. _____

2 marks

Total 15 marks

**END OF SECTION C
TURN OVER**

SECTION D – VBN 777 Handle engineering materials in a safe and proper manner**Instructions for Section D**

Answer **all** questions in the spaces provided.

Question 1

You are required to work with a material with sharp edges. List **two** ways to minimise the risk of cutting yourself.

i. _____

ii. _____

2 marks

Question 2

How do safety boots/shoes differ in construction from normal footwear?

2 marks

Question 3

Who is **the first person** responsible for ensuring Occupational Health and Safety is applied in the workplace?

1 mark

Question 4

In many workplaces employees must wear PPE. What do the initials PPE stand for?

1 mark

Question 5

Before working with chemicals, what reference material should you consult?

1 mark

Question 6

List **two** devices that you could use to assist in lifting a heavy load.

i. _____

ii. _____

2 marks

Question 7

Before manually lifting an object in the workplace you should perform a _____

1 mark

Question 8

A wire rope sling is rated at 100 kg SWL. What do the initials SWL mean?

1 mark

Question 9

Why are special precautions needed when using compressed air?

i. _____

ii. _____

2 marks

Question 10

What do the following safety warning signs indicate?



i. _____



ii. _____

2 marks

Total 15 marks

**END OF SECTION D
TURN OVER**

SECTION E – VBN 778 Produce basic engineering components using fabrication and machining techniques**Instructions for Section E**

Answer **all** questions in the spaces provided.

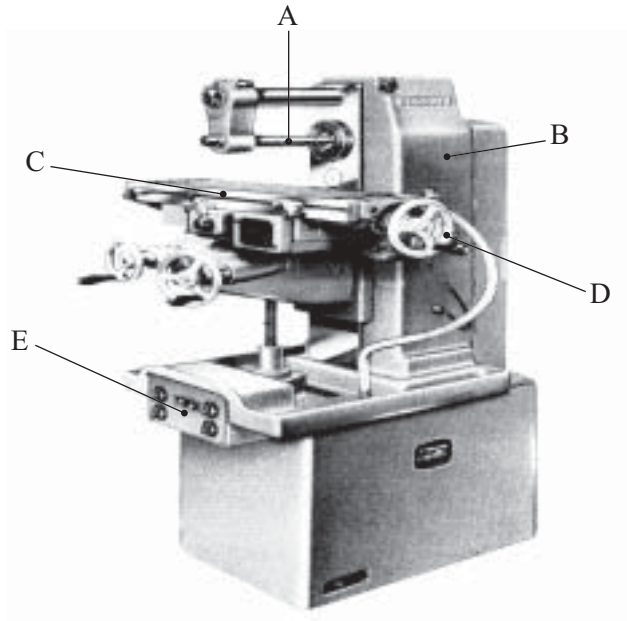
Question 1

Figure 1

Figure 1 above is a view of a milling machine.
Correctly name parts A–E.

A _____

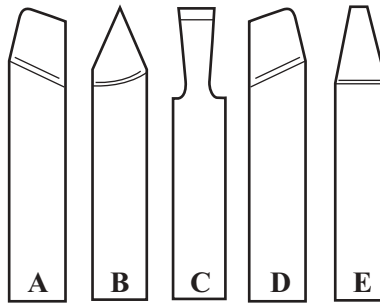
B _____

C _____

D _____

E _____

5 marks

Question 2

lathe tools

Figure 2

- a. What is the name of the lathe tool marked A?

- b. What is lathe tool A used for?

1 + 1 = 2 marks

Question 3

Give one advantage for using a tungsten carbide turning tool instead of a high-speed steel turning tool?

1 mark

Question 4

What is the full name of the drill shown?

1 mark

Question 5

Describe a method to securely clamp a **round bar** on the table of a milling machine.

2 marks

Question 6

What is a **drill drift** used for?

1 mark

Question 7

Name the following types of milling cutters.

i.



ii.



2 marks

Question 8

List **two** safety checks you would perform before turning on and using a bench grinder.

i. _____

ii. _____

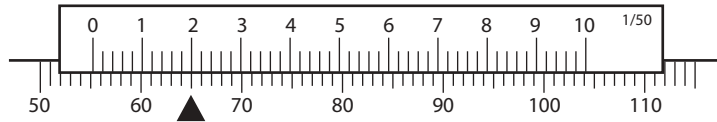
2 marks

Question 9

Lathe tailstocks can be fitted with ‘live’ or ‘dead’ centres. What is the major construction difference between a ‘live’ and ‘dead’ centre?

2 marks

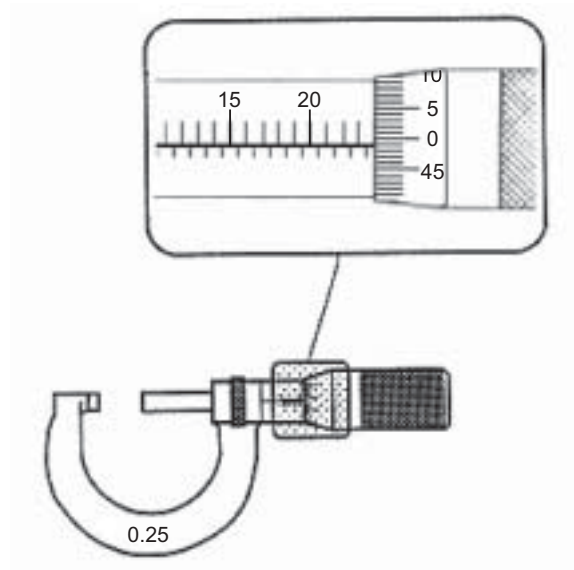
Question 10



What is the reading of the vernier caliper scale shown above?

2 marks

Question 11



What is the reading on the metric micrometer shown above?

2 marks

Question 12

Why are 'Soft Jaws' fitted on a lathe chuck?

2 marks

Question 13

Listed below are four commonly used joining methods. For each method give an example of its use.

i. Welding

Example of use _____

ii. Self-tapping screw

Example of use _____

iii. Loctite (chemical joining)

Example of use _____

iv. Set screw

Example of use _____

4 marks

Question 14

What is a datum surface?

2 marks

Question 15

Calculate the rpm for a diameter 14.5 mm drill if the recommended cutting speed is 32 m/min ($\text{rpm} = \frac{300 v}{d}$ where v = cutting speed). Show all working.

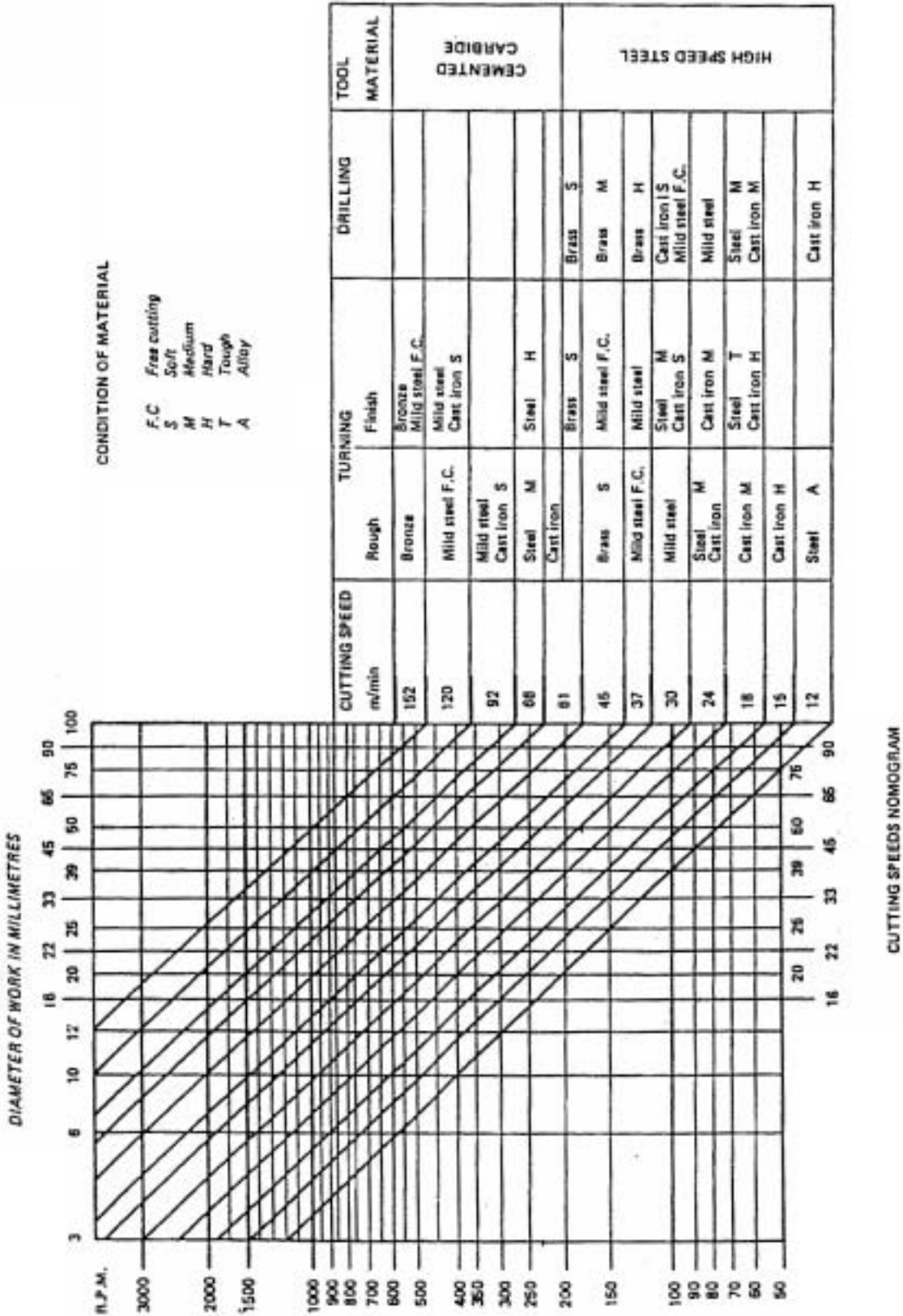
1 mark

Question 16

You are using a cemented carbide cutting tool. Use the nomogram below to determine the approximate rpm to finish turn 32 diameter cast iron (soft).

rpm

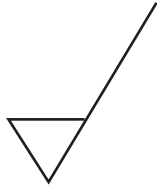
Cutting speeds nomogram



1 mark

Question 17

What does the following symbol indicate?



1 mark

Question 18

Coolant (cutting fluid) and swarf are two dangers in the workplace.

a. What type of injury can coolant cause?

b. What type of injury can swarf cause?

1 + 1 = 2 marks

Question 19

Aluminium and stainless steel are widely used in the manufacture of products. Give an example of a product made from each of these materials.

Aluminium _____

Stainless steel _____

2 marks

Question 20

Complete the following sentence.

Before using any mains-powered portable power tool, it is important that you perform a safety check to ensure

1 mark

Question 21

List **two** factors that you need to consider before selecting a 'POP' rivet to join two pieces of sheetmetal.

i. _____

ii. _____

2 marks

Total 40 marks