VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2006

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET ELECTROTECHNOLOGY

Written examination

Thursday 2 November 2006

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	20	20	20
B	10	10	80
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white-out liquid/tape.

Materials supplied
- Question and answer book of 21 pages including a formula sheet on page 21.
- 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 – Multiple-choice questions

Instructions for Section A

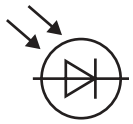
Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.
Choose the response that is **correct** or that **best answer**s the question.
A correct answer scores 1, an incorrect answer scores 0.
Marks will **not** be deducted for incorrect answers.
No marks will be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

Question 1

How many individual cells are contained in a standard 9 volt clip connection battery?

A. 1
B. 2
C. 6
D. 9

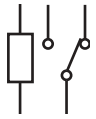
Question 2



What is the name of the device represented by the symbol above?

A. photodiode
B. light-emitting diode
C. rectifier diode
D. Zener diode

Question 3



What is the name of the device represented by the symbol above?

A. single throw switch
B. contact resistor
C. thermal switch
D. relay

Question 4

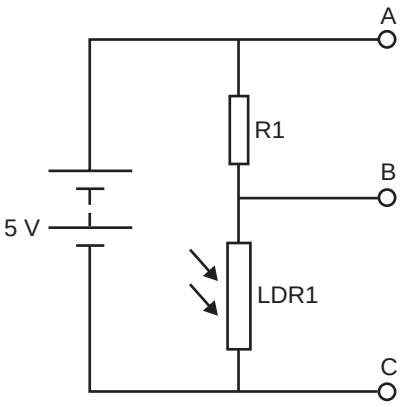


Figure 1a

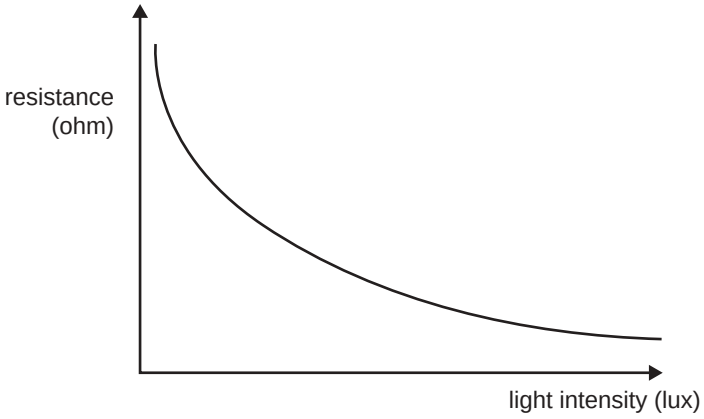


Figure 1b

The light-dependent resistor, LDR1, in Figure 1a has a resistance characteristic shown in Figure 1b.

If there is a decrease in light intensity, the voltage across R1 will

A. decrease.

B. become negative.

C. increase.

D. equal 5 V

Question 5

An appliance is fitted with a 2 amp fast-blow fuse. The fuse blows and is replaced by another 2 amp fast-blow fuse. The replacement fuse blows immediately.

What is the best action to take now?

A. fit a piece of wire to bypass the fuse

B. insert a 2 amp slow-blow fuse

C. have the appliance sent for repair

D. try a 3 amp fast-blow fuse

Question 6

An RCD (residual current detector) fitted to a switchboard provides protection against electrocution by tripping a circuit breaker when

A. current imbalance is detected between the active and neutral conductors.

B. current is detected in the earth conductor.

C. balanced current is detected in both active and neutral conductors.

D. current is detected in the neutral wire.

Question 7

How should an ESD protection wrist strap be connected to ground?

A. by connection to the PC metal case

B. through a 1 M Ω resistor to mains earth

C. by the neutral wire in a double-insulated circuit

D. by direct connection to mains earth

Question 8

The earth connection to the exposed metal case of a piece of electrical equipment has become disconnected.
What effect will this have on the operation of the equipment?

A. The switchboard fuse will blow as soon as human contact with the case occurs.
B. The switchboard fuse will blow immediately.
C. The equipment will continue to operate.
D. The RCD circuit breaker will operate.

Question 9

The main purpose of incorporating a circuit breaker is to

A. offer a discharge path to earth for static charge build up.
B. protect the circuit wiring against the effects of excessive fault currents.
C. offer electrical shock prevention from earth leakage currents.
D. protect equipment from the effects of earth leakage currents.

Question 10

A technique to preserve life is known by the letters CPR.
What does CPR stand for?

A. Cardiac Pulse Rescue
B. Chest Pressure Reticulation
C. Coronary Pulse Reticulation
D. Cardio Pulmonary Resuscitation

Question 11

On a PC motherboard, data is transferred between the CPU and onboard memory via a

A. parallel bus.
B. serial bus.
C. USB interface.
D. CAT 5 cable.

Question 12

How many numbers can be represented by an 8 bit binary code?

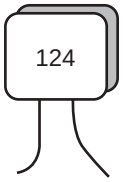
A. 8
B. 16
C. 64
D. 256

Question 13

What type of memory is used in a USB memory stick?

A. ROM
B. RAM
C. Flash
D. SIM

Question 14



What is the value of the capacitor shown above?

A. 48 picofarad
B. 120 nanofarad
C. 124 picofarad
D. 124 nanofarad

Question 15

A surface mount resistor has the numbers **103** printed on it.

What is the value of the resistor?

A. 30 ohm
B. 103 ohm
C. 1000 ohm
D. 10 000 ohm

Question 16

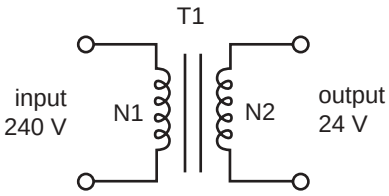


Figure 2

In Figure 2, what type of transformer is T1?

A. step-down transformer with a turns ratio of 10:1
B. step-down transformer with a turns ratio of 1:10
C. step-up transformer with a turns ratio of 10:1
D. step-up transformer with a turns ratio of 1:10

Use the following information to answer Questions 17–20.

The voltage waveform across the load resistor, R1, in Figure 3a is shown in Figure 3b.

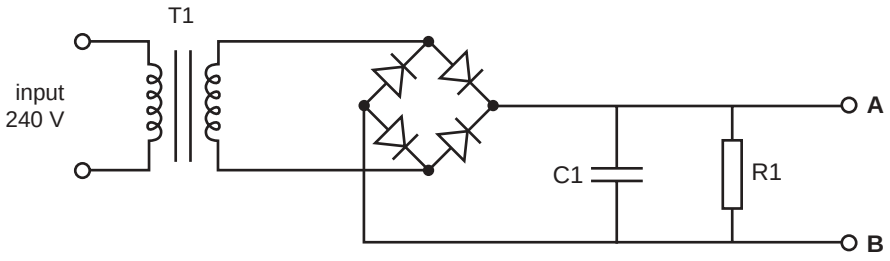


Figure 3a

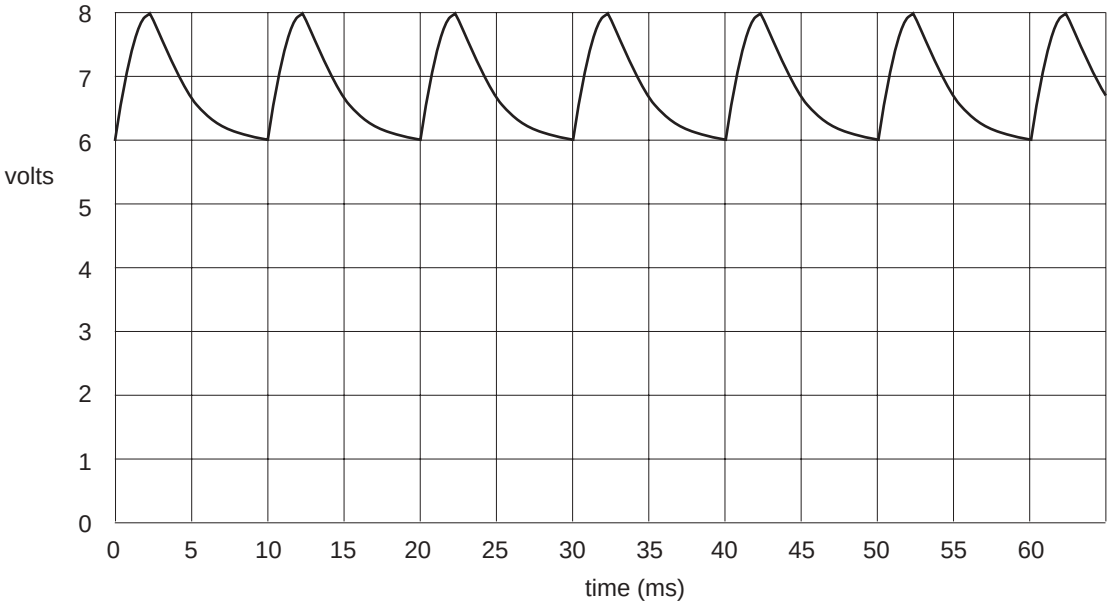


Figure 3b

Question 17

The rectifier circuit in Figure 3a is a

A. centre-tapped rectifier.

B. full-wave bridge rectifier.

C. capacitive rectifier.

D. half-wave rectifier.

Question 18

A DC voltmeter placed across the load will read approximately

A. 8 V

B. 7 V

C. 6 V

D. 0 V

Question 19

The frequency of the 240 V supply voltage is

A. 10 Hz

B. 20 Hz

C. 50 Hz

D. 100 Hz

Question 20

If the load resistor, R1, becomes an open circuit, the voltage across A–B will equal

A. 0 V

B. 6 V

C. 7 V

D. 8 V

END OF SECTION A
TURN OVER

SECTION B

Instructions for Section B

Answer **all** questions in the spaces provided.
State all formulas and calculations.
All units must be specified in the answers.

Question 1

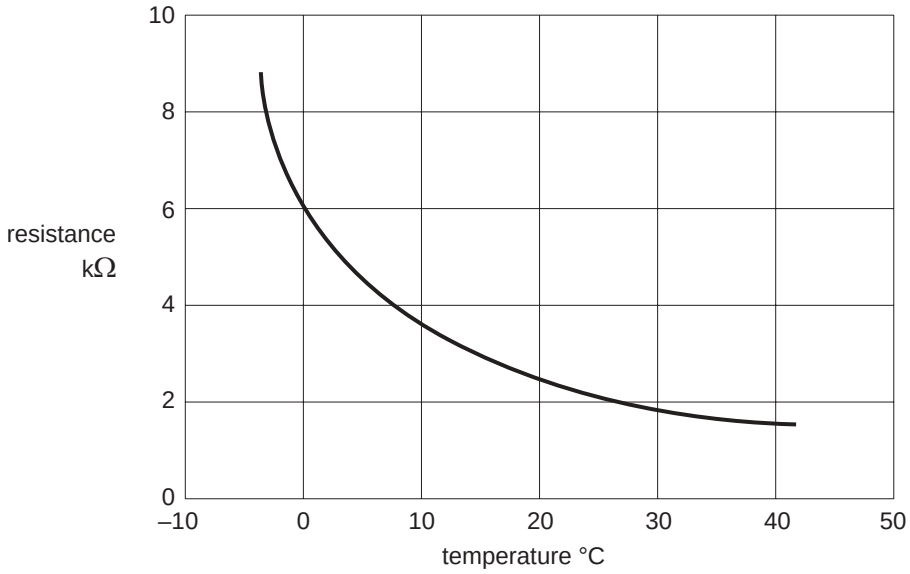


Figure 4

The resistance–temperature characteristic of a thermistor is displayed in Figure 4.

a. Use the graphical data in Figure 4 to determine the resistance of the thermistor at a temperature of 25°C.

_____

1 mark

b. At what temperature is the resistance of this thermistor 4 kΩ?

_____

1 mark

c. What effect does a rise in temperature have on the resistance of the thermistor?

_____

1 mark

d. State an application of a thermistor.

_____

_____

1 mark

Question 2

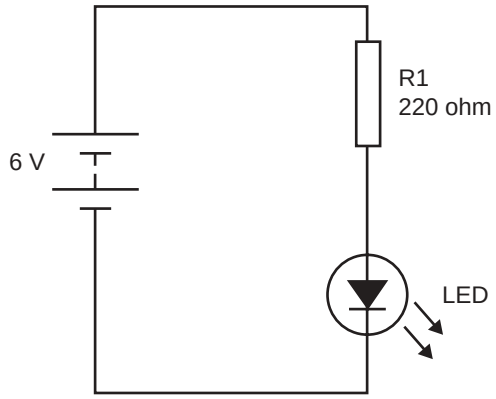


Figure 5

Refer to the circuit in Figure 5.

a. The voltage across the LED is 1.8 V. Calculate the LED current. Show your calculations.

3 marks

b. What is the purpose of the resistor, R1, in this circuit?

1 mark

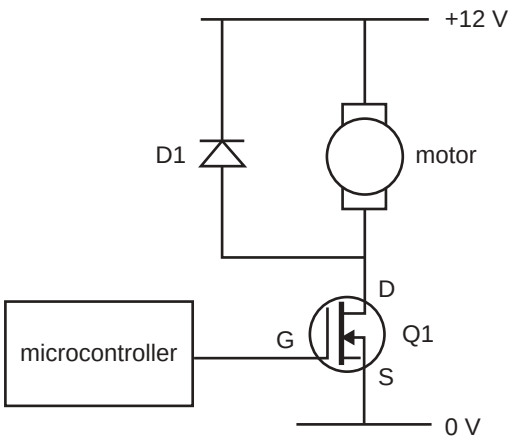


Figure 6

Refer to Figure 6 above.

The transistor, Q1, conducts a motor current of 2.1 amp. The voltage drop (V_{DS}) across the transistor is 0.1 volt.

c. Calculate the motor resistance. Show your calculations.

3 marks

d. State the purpose of the diode, D1, in Figure 6.

2 marks

Question 3

The circuit shown in Figure 7 is used to reset a microcontroller when power is applied. The push button is pressed and released when manual reset is required.

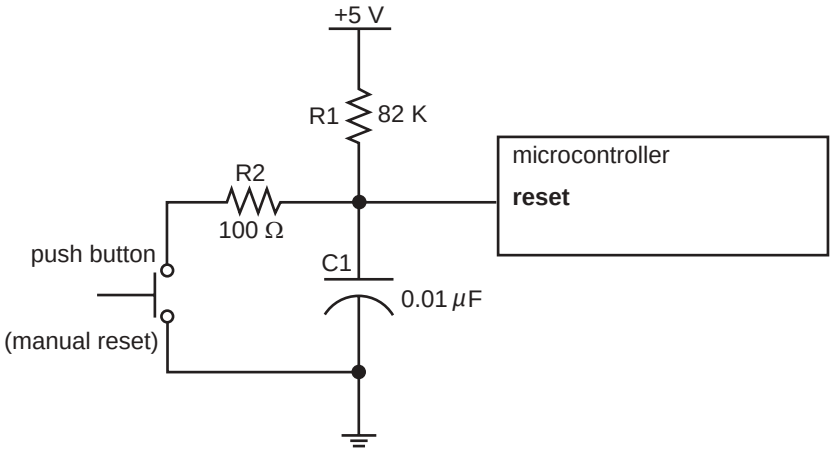


Figure 7

a. What is the maximum voltage to which the capacitor, C1, can charge?

1 mark

b. Calculate the charging time-constant.

2 marks

c. On manual reset (push button is pushed), calculate the time taken for the capacitor, C1, to become fully discharged.

4 marks

Question 4

a. State an application for a lithium battery.

1 mark

b. List **two** advantages of a lithium battery over a carbon zinc battery for the application you stated above.

2 marks

c. A microcontroller circuit requires a supply of 6.0 volts. Draw the appropriate connections between the cells and the microcontroller PCB on Figure 8.

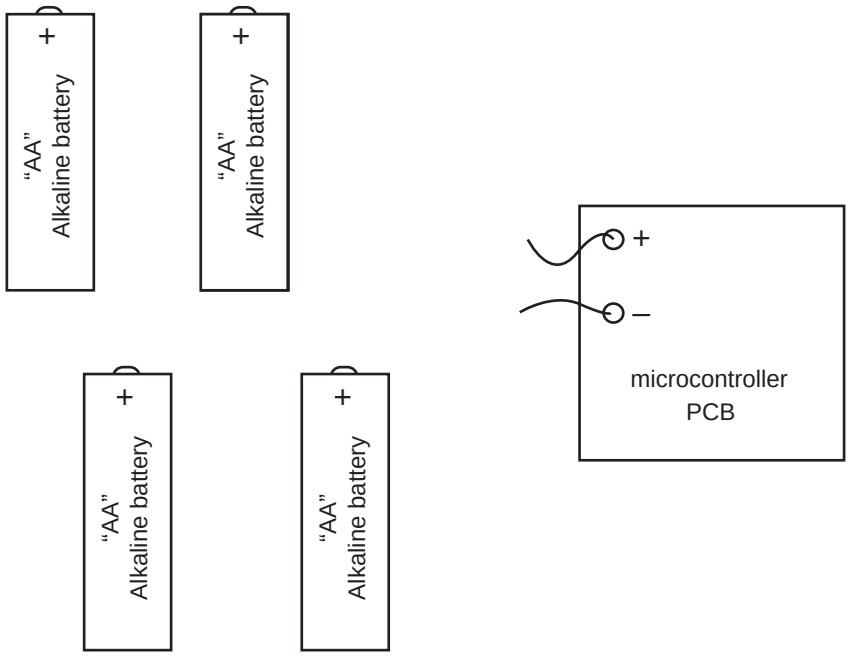


Figure 8

4 marks

d. A Ni-MH battery pack is getting hot. State a possible cause of this condition.

1 mark

Question 5

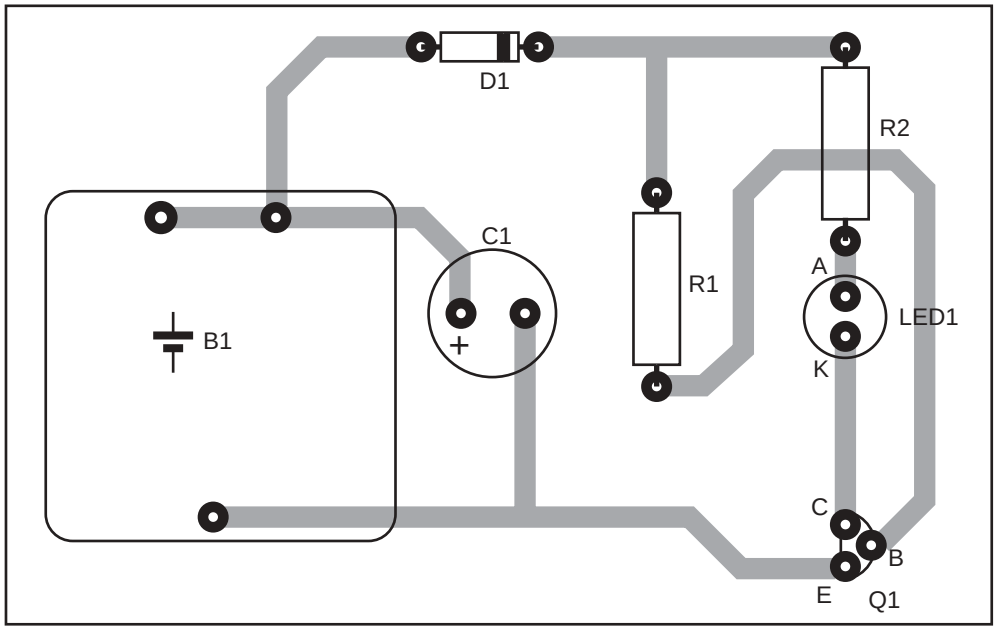


Figure 9

A printed circuit board layout is shown in Figure 9. The layout shows the component-side view.

a. State the device name of each component in the table below. B1 has been completed.

Component	Device name
B1	Battery
C1	
D1	
LED1	
R1/R2	
Q1	

5 marks

b. Complete the schematic diagram for the circuit board on Figure 10 below. Label each component: C1, D1 and so on.

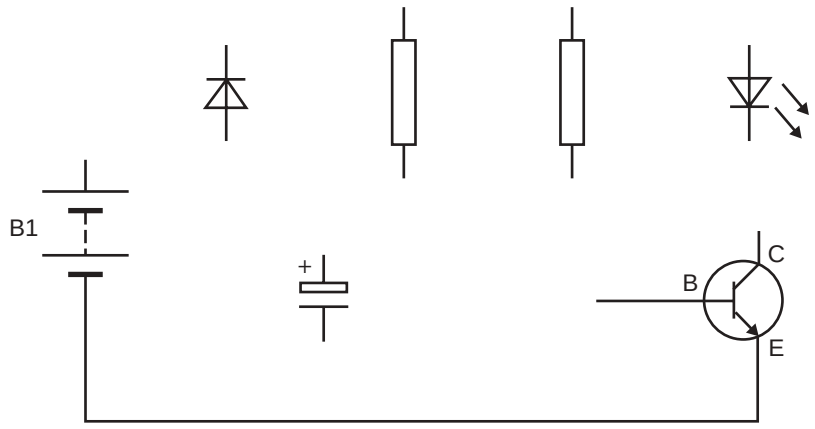


Figure 10

5 marks

c. State one item of safety equipment that should be used when soldering.

1 mark

Question 6

A system for maintaining water in a tank is shown in Figure 11a below. A flow chart to describe the operating sequence is shown in Figure 11b.

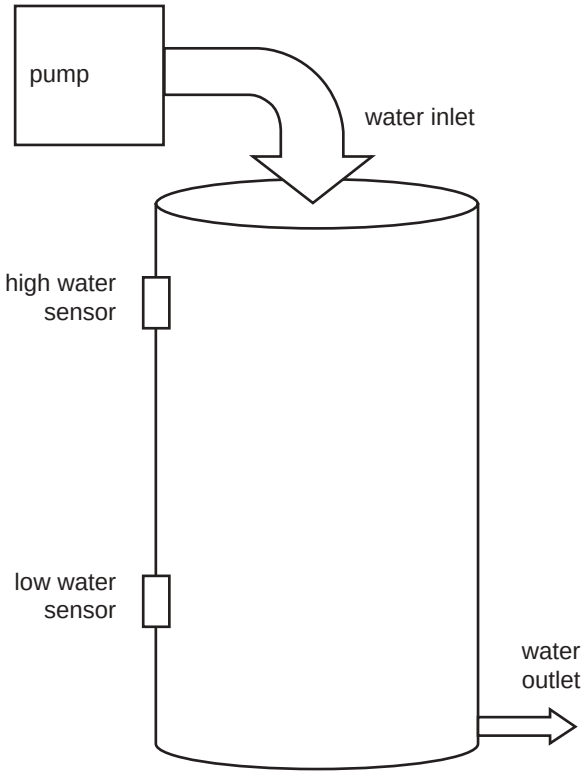


Figure 11a

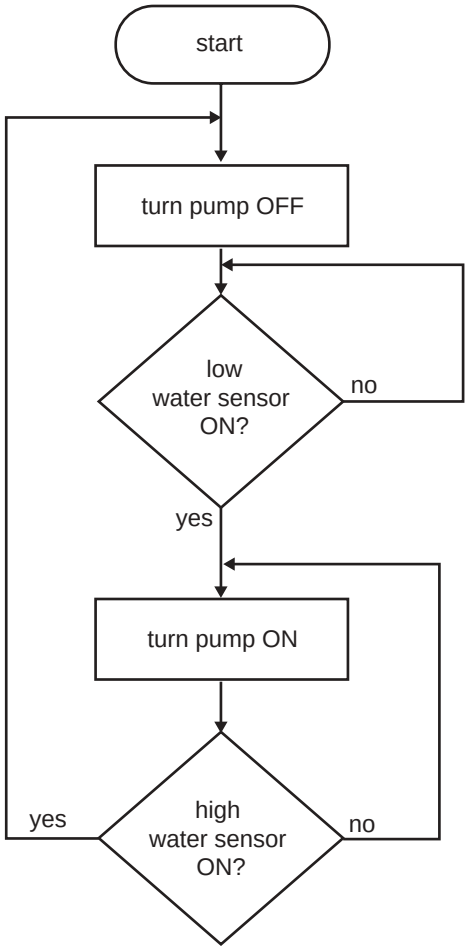


Figure 11b

a. When the **low water sensor** is ON and the **high water sensor** is OFF, explain what is happening in the system.

2 marks

b. Describe the sequence of events after the **high water sensor** switches ON until the time the tank recommences filling.

3 marks

c. Describe the effect on the system if a fault develops such that the **high water sensor** and the **low water sensor** are ON at the same time.

2 marks

Question 7

A and B are inputs and Z is the output for the circuit shown in Figure 12.

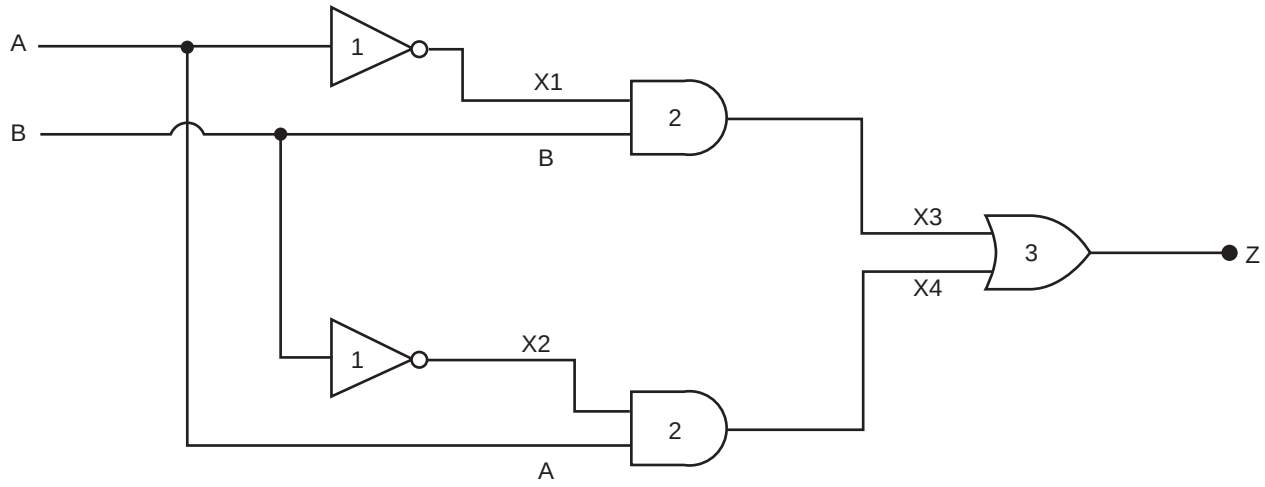


Figure 12

a. Name the **three** types of gates shown in Figure 12.

Gate 1	
Gate 2	
Gate 3	

3 marks

b. Complete the truth table below for the circuit in Figure 12.

A	**B**	**X1**	**X2**	**X3**	**X4**	**Z**
0	0		1	0		0
0	1	1	0	1		1
1	0	0		0	1	
1	1	0	0	0	0	0

5 marks

Question 8

The system board of a personal computer is shown below in Figure 13.

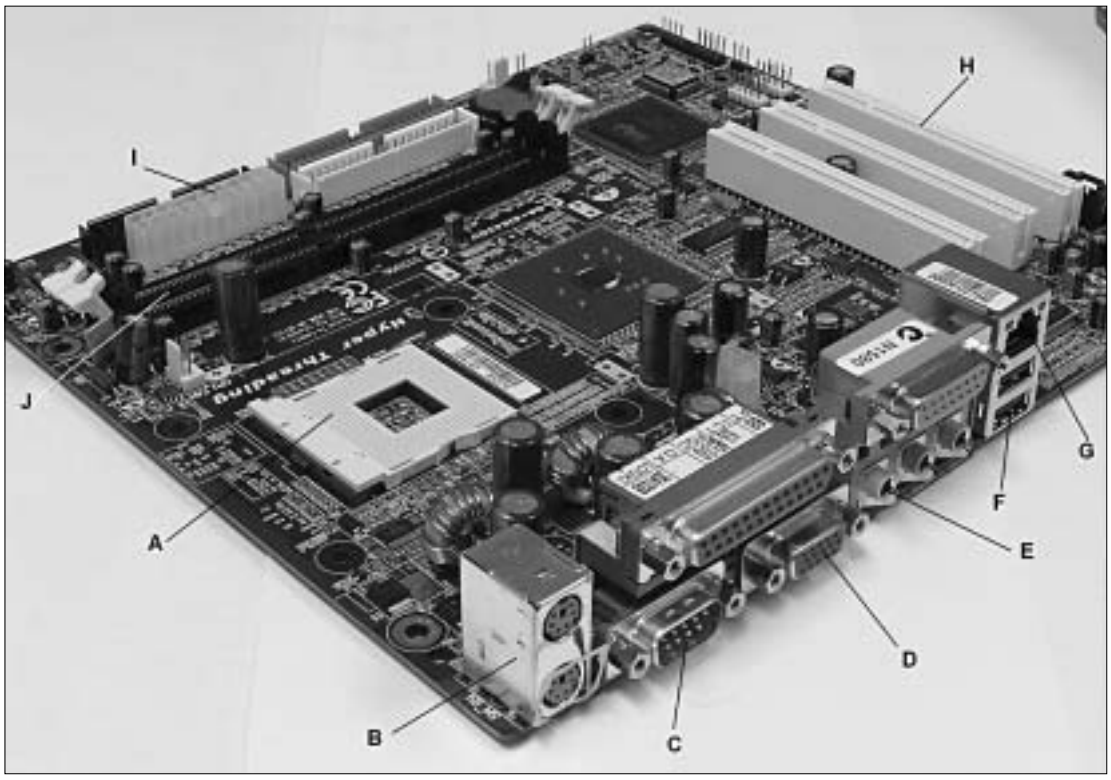


Figure 13

The CPU is to be inserted at location **A** on the system board.

a. What is the name of component **A**?

_____

1 mark

b. Name the peripheral devices that can be plugged into socket **B**.

_____

_____

2 marks

c. State the connector into which a network cable can be connected.

_____

1 mark

d. Name a device that can be connected to location **F**.

_____

1 mark

e. At which location can a PCI card be installed?

_____

1 mark

f. What plugs into connector **I**?

_____

1 mark

Question 9

ASCII code chart

Least significant nibble

Most significant nibble

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	SOH	STX	ETX	EOT	ENQ	ACK	BEL	BS	HT	LF	VT	FF	CR	SO	SI
1	DLE	DC1	DC2	DC3	DC4	NAK	SYN	ETB	CAN	EM	SUB	ESC	FS	GS	RS	US
2	SP	!	“	#	$	%	&	‘	(	)	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	DEL

Figure 14

A microcontroller system is sending a block of data to a remote computer in ASCII code format.

a. Convert the data shown in the table to ASCII. Refer to the ASCII code chart (Figure 14) above.
Write your answers in the spaces below.

Characters	SOH	G	5	d	EOT
ASCII (in Hex)					

5 marks

A small business network consists of numerous personal computers, a file server and a web server. It is critical that the file server remains operational at all times even in the event of a power failure.

b. What system could you install to ensure the server continues to function during a power failure?

_____

1 mark

In a personal computer the sound card can be used to convert audio (speech) to binary data which can then be stored on a hard drive.

c. What type of conversion is performed by the sound card?

_____

1 mark

Question 10

Figure 15 shows the properties of the ECP Printer Port (LPT1) on a PC. This printer port is also known as a parallel port.

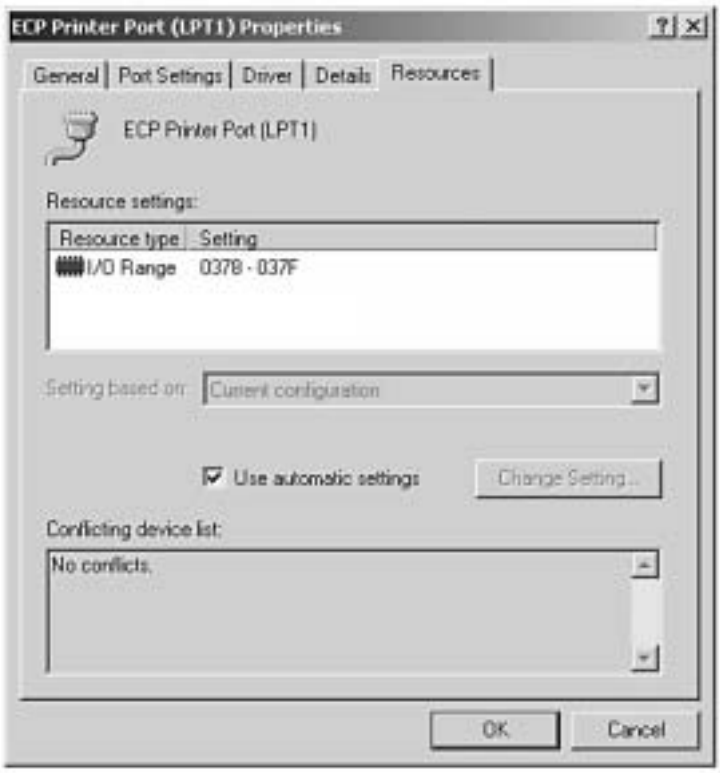


Figure 15

a. State and explain one advantage of using a parallel port compared with using a serial port.

2 marks

b. State and explain one disadvantage of using a parallel port compared with using a serial port.

2 marks

Refer to Figure 15.

The Input/Output (I/O) Range of the printer port is listed in hexadecimal form.

c. How many I/O locations are reserved for the printer port?

2 marks

d. Express the port address 0378H as a binary number.

2 marks

e. State the decimal value of the number 0378H.

2 marks

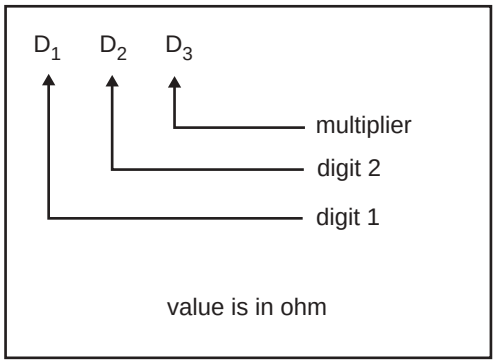
f. Name **two** types of interfaces that may be found in printers.

2 marks

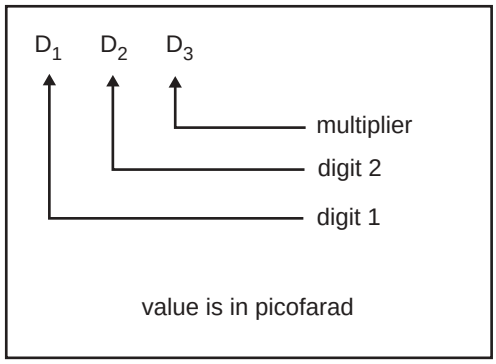
END OF SECTION B

Formula sheet

resistor code



capacitor code



$V = I \times R$

$P = V \times I$

$Q = CV$

$V_{PK} = \sqrt{2} \times V_{RMS}$

$V_{REG} = V_{IN} - V_{OUT}$

Time constant $\tau = RC$

Time constant $\tau = \frac{L}{R}$

$f = \frac{1}{T}$

Turns ratio $= \frac{N1}{N2}$

END OF QUESTION AND ANSWER BOOK