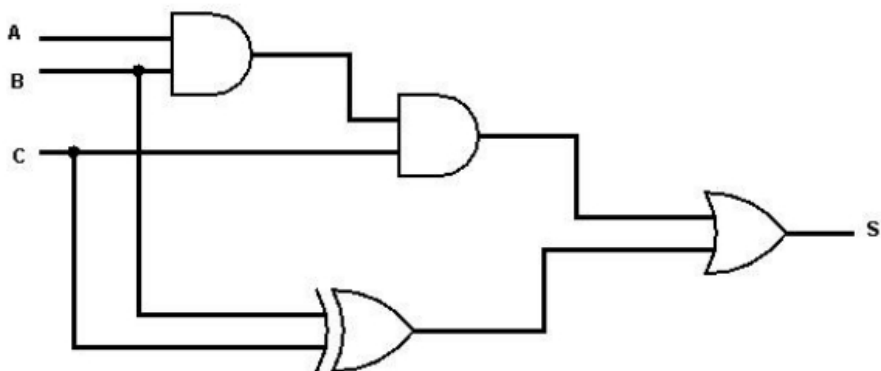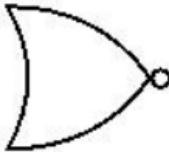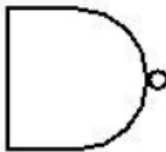| Question	Answer	Marks
5(a)	**1 mark** per bullet point to **max 2** • Definition: Microprocessor/microcontroller within a **larger system** // microprocessor/microcontroller that performs **one specific task** • Example: e.g. Embedded system in washing machine only controls the programs for the washing cycle // it is part of the washing machine but does not perform any other function within it	2
5(b)	**1 mark** for RAM, **1 mark** for ROM RAM: • **Store** the choices/wash program the user has entered // **stores** the data read from the sensors // **stores** the time left in the program // by example ROM: • **Store** the start-up instructions (for the washing cycles)	2
5(c)	**1 mark** per bullet point • The system uses feedback • The system causes the temperature to change // produces an action	2

Question	Answer	Marks
8	**1 mark** per correct row	3

Statement	AND	NAND	NOR	XOR	OR
The output is 1 only when both inputs are 1	✓				
The output is 1 only when both inputs are different				✓	
The output is 1 only when both inputs are 0			✓		

Question	Answer	Marks
3(a)	**1 mark** for each correct gate, with correct inputs	4

Question	Answer	Marks
3(b)	**1 mark** for each half (shaded)	2

A	B	C	Working space	S
0	0	0		0
0	0	1		1
0	1	0		1
0	1	1		0
1	0	0		0
1	0	1		1
1	1	0		1
1	1	1		1

Question	Answer	Marks
3(a)	**1 mark** per bullet point • A AND B … • … XOR C … • … OR NOT B ((A AND B) XOR C) OR NOT B	3

Question	Answer	Marks
3(b)	**1 mark** for each set of 4 rows (shaded)	2

A	B	C	Working space	X
0	0	0		1
0	0	1		1
0	1	0		0
0	1	1		1
1	0	0		1
1	0	1		1
1	1	0		1
1	1	1		0

Question	Answer	Marks
3(c)	**1 mark** for gate, **1 mark** for matching symbol, **1 mark** for matching truth table	3

NOR

A	B	OUTPUT
0	0	1
0	1	0
1	0	0
1	1	0

NAND

A	B	OUTPUT
0	0	1
0	1	1
1	0	1
1	1	0

Question	Answer	Marks
2(a)(i)	**1 mark** for each correct term. Random Access Memory (RAM) and Read Only Memory (ROM) are both examples of **primary** memory. One item that is stored in RAM is **currently running software/data/part of OS**. One item that is stored in ROM is **the start-up/boot-up instructions/BIOS**. RAM can be either Static RAM (SRAM) or Dynamic RAM (DRAM). SRAM uses transistors arranged as **flip-flops/latches.** DRAM uses transistors and **capacitors**.	5
2(a)(ii)	**1 mark** per bullet point to max 3 • PROM can be set once, EPROM and EEPROM can be overwritten multiple times. • EPROM needs to be removed from device EEPROM can be erased in situ. • EPROM and can be erased using UV light, EEPROM can be erased using voltage // is flash storage . • EPROM must be entirely erased before rewriting, EEPROM does not have to be entirely erased before rewriting.	3

Question	Answer	Marks
2(b)	**1 mark** per bullet point to **max 5** • The hard disk has (one or more) platter/plate/disk • Each surface of the platter/disk is (ferrous oxide which is) capable of being magnetised • The platters/disks are mounted on a (central) spindle • The entire mechanism is contained inside a sealed (aluminium) box. • The disks are rotated (at high-speed) • (Each surface of the disk) has a read/write head mounted on an arm (positioned just above the surface) • Electronic circuits control the movement of the arm (and hence the heads) • The surface of the platter/disk is divided into <u>concentric</u> tracks / circles • The surface of the platter/disk is divided into sectors • One track in one sector is the basic unit of storage called a block • The data is encoded as a magnetic pattern for each block • When writing to disk, a variation in the current in the head produces a variation in magnetic field on the disk • When reading from disk, a variation in magnetic field produces a variation in current through the head	5
2(c)(i)	**1 mark** for each correct row. 	Gate	Input 1	Input 2
AND	1	1
NAND	0 0 1	0 1 0
XOR	0 1	1 0
NOR	0	0		4
2(c)(ii)	**1 mark** per bullet point • **A** NAND **B** • **B** XOR **C** • OR (**A** NAND **B**) OR (**B** XOR **C**)	3

Question	Answer						Marks
4(a)	**1 mark** per pair of outputs (shaded)						4

A	B	C	Working space	X
0	0	0		0
0	0	1		1
0	1	0		0
0	1	1		0
1	0	0		0
1	0	1		1
1	1	0		0
1	1	1		0

Question	Answer	Marks
4(b)	1 mark for all three gates: OR XOR NOT	1

Question	Answer	Marks
4(a)	**One mark** per bullet point to **max 2** E.g. • Optical Disc Drive // CD/DVD Drive/Writer • Solid State Drive // USB Flash drive	2

Question	Answer	Marks
4(b)	**One mark** per bullet point to **max 4** • Main component of a scanner is a CCD (Charge Couple Device) array • CCD is a collection of light sensitive diodes • Laser beam / light shines onto the source document/barcode • The scanned image reaches the CCD through mirrors and lenses • Sensors detect levels of reflected light • Brighter light results in greater electrical charge • Light intensity is converted (by software) to a digital value	4
4(c)	**One mark** for correct lines from each type of RAM **Type of RAM** **Description** SRAM DRAM Is less expensive to manufacture Needs to be refreshed Has more complex circuitry Is often used as cache Has faster access time	2

Question	Answer	Marks
2(a)	**1 mark** for first three rows, **1 mark** for the touchscreen being both.	2

Device	Input	Output
LCD Monitor		✓
Microphone	✓	
Keyboard	✓	
Touchscreen	✓	✓

Question	Answer	Marks
2(b)(i)	**1 mark** for **1 correct** entry **2 marks** for **2 correct** entries **3 marks** for **3 correct** entries **4 marks** for **5 correct** entries 1 The object is designed using Computer Aided Design (CAD) software 2 **C** (The software splits the object into slices) 3 **E** (The data about the slices is sent to the printer) 4 The solid plastic is melted and transferred to the nozzle 5 **A** (A stepper motor moves the nozzle into position) 6 **D** (The nozzle extrudes the molten plastic) 7 The steps 5 to 6 repeat until the layer is complete 8 **B** (A fan cools the layer) 9 The steps 4 to 8 are repeated for each subsequent layer	4
2(b)(ii)	**1 mark** per bullet point. **Max 3** for RAM, **max 2** for ROM RAM • Stores currently running parts of the 3D printer software • Stores the data about the layers being printed // contents of buffer • Stores current progress of printing • Stores the data about the printer, e.g. Plastic levels, nozzle position ROM • Stores the operating software for the 3D printer // OS for the 3D printer • Stores the boot-up/start-up instructions for the 3D printer	4

Question	Answer					Marks
5(a)	**1 mark** for each pair of correct answers (shaded)					4

A	B	C	Working space	X
0	0	0		0
0	0	1		1
0	1	0		1
0	1	1		0
1	0	0		1
1	0	1		1
1	1	0		0
1	1	1		0

Question	Answer	Marks
5(b)	**1 mark** for name, **1 mark** for symbol, **1 mark** for truth table	3

- NAND

Input		Output
A	**B**	
0	0	1
0	1	1
1	0	1
1	1	0

- NOR

Input		Output
A	**B**	
0	0	1
0	1	0
1	0	0
1	1	0