

6(a)	1 mark for each correct description, max 2 marks <table border="1"> <thead> <tr> <th>Register</th><th>Role</th></tr> </thead> <tbody> <tr> <td>ACC</td><td>stores the intermediate results of arithmetic and logical operations // holds the result of a calculation</td></tr> <tr> <td>CIR</td><td>holds the instruction currently being decoded and/or executed</td></tr> </tbody> </table>	Register	Role	ACC	stores the intermediate results of arithmetic and logical operations // holds the result of a calculation	CIR	holds the instruction currently being decoded and/or executed
Register	Role						
ACC	stores the intermediate results of arithmetic and logical operations // holds the result of a calculation						
CIR	holds the instruction currently being decoded and/or executed						
6(b)	1 mark per bullet point, max 2 marks e.g. - Latency may be increased ... because the cores must communicate with one another - There is a potential for dead-lock situations ... where one core may wait for information from other cores which in turn are waiting for the first one - Not all software is designed to use multi-cores ... so some of the additional cores would be idle - Increased heat generation ... which could cause damage to other components						
6(c)	1 mark per bullet point, max 3 marks - DRAM requires to be refreshed/charged SRAM does not request a refresh - DRAM stores each bit as charge SRAM uses flip-flop to store each bit - DRAM is less expensive to manufacture SRAM is more expensive to manufacture - DRAM has slower access speeds SRAM has faster access times - DRAM has higher <u>storage/bit/data density</u> SRAM has lower storage/bit/data density - DRAM is used in main memory SRAM is used in cache						
9	1 mark per bullet point, max 3 marks - Monitoring systems do not take any action whereas control systems act autonomously to change the environment if the values are out of a prescribed range - Control systems use actuators monitoring systems do not have any actuators - Control systems make use of feedback monitoring systems do not make use of feedback - The output from a monitoring system does not affect the subsequent input whereas output from a control system affects the next input.						

10(a)	1 mark per bullet point, max 3 marks Generic mark points: (max 3) - Additive manufacturing - Uses a digital file created from 3D modelling software or Computer Aided Design (CAD) software - The printer builds up the model one layer at a time - The process is repeated for each layer - Some materials may need time to cool and set or UV curing using LEDs for photopolymer resins Specific mark points: (max 1) e.g. - Fused Deposition Modelling (FDM) // Material is heated and pushed through nozzle / extruder - Stereolithography (SLA) // Photosensitive liquid resin is exposed to a UV-laser beam - Digital Light Processing (DLP) // Photosensitive liquid resin is exposed to a UV projected image of the layer to cure the resin - Selective Laser Sintering (SLS) // Uses a laser to form objects from powdered material, the material can be plastics or metals
10(b)	1 mark - To free up the processor to carry out other tasks as the rate data is received by the printer is different from the rate at which it can be processed - To manage the mismatch in speed between the processor and the peripheral / 3D printer

9(a)	1 mark per bullet point, max 2 marks - NOT (A XOR B) - NAND ((B AND C) OR A) $X = (\text{NOT } (A \text{ XOR } B)) \text{ NAND } ((B \text{ AND } C) \text{ OR } A)$ $// X = ((B \text{ AND } C) \text{ OR } A) \text{ NAND } (\text{NOT } (A \text{ XOR } B))$
9(b)	1 mark for 1 or 2 row numbers correct, 2 marks all three correct Row 2 Row 4 Row 7

6(a)

- **One** mark for working, (all four columns P, Q, R and S)
- **One** mark for first four rows of column Z
- **One** mark for second four rows of column Z

			Working space				
A	B	C	P	Q	R	S	Z
0	0	0	1	1	0	0	1
0	0	1	1	1	1	1	1
0	1	0	0	0	1	0	1
0	1	1	0	0	0	0	0
1	0	0	1	0	0	0	1
1	0	1	1	0	1	0	1
1	1	0	0	1	1	0	1
1	1	1	0	1	0	0	0

6(b)(i)

- Two** marks if no errors present
One mark if only one error present

A	BC			
	00	01	11	10
0	0	1	1	0
1	0	1	0	1

6(b)(ii)

- One** mark for each correct loop (**Max 2**)

A	BC			
	00	01	11	10
0	0	1	1	0
1	0	1	0	1

6(b)(iii)

- One** mark for each mark point (**Max 2**)
- One correct Boolean term with a + / OR sign
 - All Boolean terms and operators correct and no other terms present

$$\bar{A}.C + \bar{B}.C + A.B.\bar{C}$$

4(a)

1 mark each:

- $X = (R \text{ NOR } S) \text{ XOR } T$
- $Y = (T \text{ AND } U) \text{ OR } U$

4(b)

1 mark for first four rows, **1 mark** for second four rows

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

1(a)

1 mark for: $(A \text{ XOR } B) \text{ NOR } C$

1(b)

- 1 mark** for NOT B XOR C
1 mark for NOT A and final AND plus NOT

