

Revision Sheet

A-Level Computer Science · Unit 15 Hardware and Virtual Machines

12 vocabulary items · 23 marks of exam questions (4 questions)

Part 1 · Vocabulary review answer key. Section A wants the exact English spelling.

Question	Answer	Marks
1	truth tables	1
2	sum-of-products	1
3	CISC	1
4	RISC	1
5	MIMD	1
6	massively parallel	1
7	Boolean algebra	1
8	Karnaugh map	1
9	half adder	1
10	full adder	1
11	SR flip-flop	1
12	JK flip-flop	1

13(a)	<table><tr><th>A</th><th>B</th><th>C</th><th>X</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>0</td></tr><tr><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td></tr></table>	A	B	C	X	0	0	0	1	0	0	1	0	0	1	0	0	0	1	1	0	1	0	0	0	1	0	1	0	1	1	0	0	1	1	1	0
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13(b)	$X = \overline{A}.\overline{B}.\overline{C}$																																				
13(c)	<p>(Max 2) for correct working from points shown</p> <p>$(T =) X.Y.Z + X.\overline{Y}.Z + \overline{X}$</p> <p>Distributive law</p> <p>$(T =) X.Z.(Y + \overline{Y}) + \overline{X}$</p> <p>Complement law</p> <p>$(T =) X.Z.(1) + \overline{X}$</p> <p>Identity law</p> <p>$(T =) X.Z + \overline{X}$</p> <p>Redundancy law (to get final answer)</p> <p>One mark for correct answer</p> <p>$(T =) \overline{X} + Z$</p>																																				

14	SIMD (1) many/array processors execute the same instruction using different data sets (1) MISD (1) many processors (using different instructions) use the same data set (1) MIMD (1) many processors (using different instructions) using different data sets (1)
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15(a)	<p>RISC max 2 any two from:</p> <ul style="list-style-type: none"> • Uses simple instructions • Uses fixed length instructions • Instructions only require one clock cycle • Uses many registers • Makes use of pipelining • Hardwired CU <p>CISC max 2 any two from:</p> <ul style="list-style-type: none"> • Uses many instruction formats • Uses variable length instructions • Makes use of different addressing modes • Uses few registers • Has a large instruction set • Requires complex circuits • Frequently uses cache • Instructions (converted to sub-instructions that) may require many clock cycles • Programmable CU
15(b)	<p>One mark for each difference max 2 from:</p> <ul style="list-style-type: none"> • RISC has fewer instructions // CISC has more instructions • RISC has many registers // CISC has few registers • RISC's instructions are simpler // CISC's instructions are more complex • RISC has a few instruction formats / CISC has many instruction formats • RISC usually uses single-cycle instructions// CISC uses multi-cycle instructions • RISC uses fixed-length instructions // CISC uses variable-length instructions • RISC has better pipelineability // CISC has poorer pipelineability • RISC requires less complex circuits// CISC requires more complex circuits • RISC has fewer addressing modes // CISC has more addressing modes • RISC makes more use of RAM// CISC makes more use of cache/less use of RAM • RISC has a hard-wired control unit // CISC has a programmable control unit • RISC only uses load and store instructions to address memory // CISC has many types of instructions to address memory
16	<p>Two marks each benefit description max 4</p> <p>New system can be tried on different virtual hardware (1) without need to purchase the hardware (1)</p> <p>Easier to recover if software emulating the new computer causes system crash (1) as VM provides protection to other software (1)</p> <p>Emulate programs for the new computer system that are not compatible with the host computer / operating system (1) by using the guest operating system on the old computer (1)</p> <p>More than one new computer system can be emulated (1) this allows multiple operating systems to coexist on a single computer(1)</p> <p>Two marks each limitation description max 2 from:</p> <p>Virtual machines may not be able to emulate the new hardware (1) because this hardware may have been developed since the virtual machine was developed (1)</p> <p>Using virtual machine means execution of extra code // A virtual machine might not be as efficient // resources e.g. memory or processor time are shared (1) processing time increased // performance degrades (1)</p> <p>Use of a virtual machine increases the maintenance overheads (1) because both host system and the virtual machine must be maintained (1)</p>