School of Business Leadership & Enterprise

FdSc Communication Technologies:

Software Engineering and Network Engineering

Level: 4

Module: Computer Platforms

Assessment: Mock TCA

Module Tutor: Dr Nicholas HM Caldwell

Weighting in Module:50%

Hand out: 18th March and 21st March 2014

Hand in: **on or before 18th March and 21st March 2014, noon** [to Assessment Centre, WF 1st floor or SafeAssign  
 Please make sure you obtain and keep a receipt]

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| **What is required?**  An electronic copy of your answers uploaded via ‘SafeAssign‘ to the LearnUCS (in a document format readable at UCS, i.e. Word 2003-2010 or PDF ). You should use your UCS userid as the document filename  You may need to copy&paste screenshots and source code from Rolecks or another ARM assembler package into the document |
| **Learning outcomes to be assessed:**  **Learning Outcomes 1, 2, 3, 4 and 5 from Handbook**   1. Identify and explain the purpose and principles of operation of the hardware and software components of computer and microprocessor based systems. 2. Use basic computer/network terminology 3. Describe how data is represented and processed within a computer 4. Describe and understand the core features of a computer operating system, and demonstrate an understanding of scheduling, memory management, file systems and input/output 5. Compare and contrast different ways that different operating systems provide features to users |
| **Graduate Key Skills:**  The assignment can give evidence for GKS: IT1 and IT2 |
| **Assessment & Grading Criteria:**  overleaf |
| **Assessment Brief.**  See page 4 |

**Assessment Criteria**

To achieve a Pass in this Assignment, the stated Pass criteria must be achieved

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| **Learning Outcomes Assessed in this Assessment** | **PASS criteria** |
| 1. Identify and explain the purpose and principles of operation of the hardware and software components of computer and microprocessor based systems. 2. Use basic computer/network terminology, and perform number conversions/subnet calculations 3. Describe how data is represented and processed within a computer 4. Describe and understand the core features of a computer operating system, and demonstrate an understanding of scheduling, memory management, file systems and input/output 5. Compare and contrast different ways that different operating systems provide features to users 6. Explain the basic components of network architectures and supporting protocols. | In order to be awarded a pass grade (P− or above) for this assignment you must meet the following criteria.   * You must score a minimum of 40% (40 marks) for the 21 questions * You must submit your work: * anonymously (i.e. you must identify yourself using only your student number); * word processed;   with the answers to all questions appropriately identified. |

Grading criteria follow…….

To achieve a higher grade it is the quality of work that will be considered, rather than the amount of work done, and will be assessed against the given criteria:

**Generic Grading criteria for Level 4**

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| **Good Pass** | In order to be awarded a grade of “Good Pass” (G−, G= or G+)  your score for the 21 questions must greater than or equal to 50% (50 marks) and less than 60% (50 marks) |
| **Merit** | In order to be awarded a grade of “Merit” (M−, M= or M+)  your score for the 21 questions must greater than or equal to 60% (60 marks) and less than 70% (70 marks) |
| **Distinction** | In order to be awarded a grade of “Distinction” (D−, D= or D+)  your score for the 21 questions must greater than or equal to 70% (70 marks) |

**Mock TCA**

**Attempt all questions**

Qu 1: Describe some key differences in terms of hardware and software between computers of the first generation and the second generation. (5 marks)

1st generation computers used vacuum tubes to process data input on punched cards. The computer might take up a large room, and the software on these machines would perform mathematical and statistical calculations for use in research and code-breaking. An example of a first generation computer would be the code-breaking machine used during WWII called *Colossus*.

2nd generation computers were much smaller (personal computer size), as they used silicon transistors to process instructions. They would take input from a variety of peripherals such as a keyboard, hard disk or floppy disk drive. The software on these machines was more general purpose – there would be an operating system which would then host various application programs.

Qu 2: Describe briefly some of the key capabilities provided by the kernel of an operating system (5 marks)

The kernel of the operating system is responsible for allocating memory and processor time to be given to other programs (applications) running on the system. The kernel is also responsible for security between programs, ensuring different programs do not interfere with each other, except through recognized and regulated channels. The kernel usually includes the drivers needed to use the system hardware, meaning applications do not have to directly handle the hardware, they can tell the kernel what they need through an API and the kernel will provide it if it deems it safe to do so.

Qu 3: Convert the following denary numbers into binary, octal and hexadecimal (6 marks)

1. 75

Binary: 1001011

Octal: 113

Hex: 1B

1. 494

Binary: 111101110

Octal: 756

Qu 4: Convert the following unsigned binary values into decimal (4 marks)

A) 11010011 211

B) 11001100 204

C) 101011001111 2767

D) 11001101.0110 205.0.375

Qu 5. Convert the following octal numbers into decimal numbers. (2 marks)

1. 67 55
2. 324 212

Qu 6. Convert the following hexadecimal numbers into decimal numbers. (2 marks)

A) D4A 3402

B) 2BC 700

Qu 7. Perform the following binary additions (3 marks)

A. 1 0 1 1 0 B. 1 1 0 1 0 1 C. 1 0 0 1 1 0

+ 1 1 0 1 + 1 0 1 1 + 1 1 0

1 0 0 0 1 1 1 0 0 0 0 0 0 1 0 1 1 0 0

Qu 9. Perform the following binary multiplications (3 marks)

A. 1 1 1 1 0 B. 1 0 1 0 1 1 C. 1 1 1 0 1 0

x 1 0 0 1 x 1 1 0 1 x 1 1 1

100001110 1000101111 110010110

Qu 10: What is the denary value being stored in the 8 bit binary value 10011111 if the format of the data is a) unsigned binary, b) sign and magnitude, and c) 2's complement? (3 marks)

1. 95
2. -31
3. 33

Qu 11: Represent -68 in a) 8 bit sign and magnitude, and b) 8 bit 2's complement (2 marks)

1. 11000100
2. 10111100

Qu 12: a. convert the following address and the subnet mask (written in denary) into their equivalent binary bits

b. Perform bitwise logical AND between the two

c. Convert the answer to an address in denary (5 marks)

address: 192.168.75.43

subnet mask: 255.255.000.000

1. address : 11000000.10101000.01001011.00101011

subnet mask: 11111111.11111111.00000000.00000000

1. 11000000.10101000.00000000.00000000
2. 192.168.0.0

Qu 13: Assuming the bit patterns below represent 32-bit floating point numbers according to the IEEE standard with a sign bit first, 8 bit exponent and remaining bits as significand, with an emax of +127, convert the numbers to decimal (5 marks)

1. 0 11111111 00000000000000000000000 +infinity
2. 1 10000000 11000000000000000000000 -1.75
3. 0 10000011 00000000000000000000000 1000

Qu 14: Explain the difference between lossless and lossy compression with two examples of when to use lossless and two of when to use lossy compression (10 marks)

When a lossy compressed file is decompressed, the output will be different from the uncompressed original. In the case of a sound file, inaudible sounds may be removed, or the sample rate reduced. With lossless compression, the decompressed file will be identical to the original file. In the case of picture files, lossy compression is useful on websites, where bandwidth is limited and a smaller file size will improve page loading times. Lossless compression is useful in photography, where large amounts of files will be stored, but the photographer want to lose none of the quality captured by his equipment. The same goes for sound files: lossy is good for casual listening on speaker systems and headphones that could not reproduce the quality difference anyway, while lossless is used in audio production or scientific experiments where space is an issue but quality cannot be compromised.

Qu 15: Describe the sequence of actions involved in a memory read including details of address valid, R/, and chip select wires (10 marks)

Qu 16; What is a register and give two examples of registers with reference to the ARM architecture? (5 marks)

A register is a part of the CPU that can store a binary value: a register will store the values the CPU is currently working with. On an ARM chip, the PC register is the program counter – it stores the address of the next instruction to be executed by the CPU. The Instruction Register stores the command the CPU is currently executing.

Qu 17: Describe the differences between DRAM and SRAM (5 marks)

Dynamic RAM must be regularly refreshed for it to keep the values it has stored. It is generally cheaper than SRAM. SRAM consumes less electricity, and can hold values as long as the system is powered on.

Qu 18 Design with flowcharts and then write an ARM assembly language program that adds the numbers 1 to 10, storing the final result in a register (10 marks)

write 0 to reg 1

write 1 to reg 0

label: loop

add reg 0 to reg1

Jump to loop

no

add 1 to reg 0

output reg1

reg0 == 11?

yes

Qu 19 Write an ARM assembly language that loads two numbers from memory into registers, multiplies them together and stores the result out to another location in memory (5 marks)

Qu 20 In pipelining, what are data hazards and branch hazards? (5 marks)

A data hazard happens when multiple instructions are being executed by a pipelining CPU, but the second instruction depends on the output of the first instruction. The pipeline may have to stall until the result of the first instruction is found, or use instruction forwarding to get the answer to the second instruction before the first instruction is out of the pipe. A branch hazard happens when a command is received by the processor to jump to another point in the program, but other instructions beyond the jump in memory are already in the pipeline. The processor may have to flush the pipeline as it has instructions executing that come from the wrong route.

Qu 21 Describe the differences between direct-mapped, fully associative and set associative caches (5 marks)

Direct-mapped memory is a policy between a memory space and its cache. The cache stores values from memory in the same location they would appear in memory, using a modulus calculation to clamp the values to fit the size of the cache.

Fully associative memory is where a set of associations or mappings are stored in a lookup table. The cache can then use its own policy to store data from memory – when the values are written or read to memory, the mappings are consulted to determine where the data should go.

Set associative memory is where memory within given sections of the cache are direct-mapped, but different sections are stored in places recorded by a mapping table.