UNIVERSITY OF GHANA

BACHELOR OF SCIENCE IN ENGINEERING
FIRST SEMESTER EXAMINATIONS: 2015/2016

DEPARTMENT OF COMPUTER ENGINEERING

CPEN 413: MICROPROCESSOR SYSTEMS AND INTEGRATION (3 Credits)

INSTRUCTION: *ANSWER ANY FIVE (5) QUESTIONS*

TIME ALLOWED: *TWO AND A HALF (2 ½) HOURS*

1.

a. Using a 68000 microprocessor or otherwise explain how two binary numbers may be subtracted. Illustrate your answer with the aid of a flowchart. (10 marks)

b. Write a pseudo code for this flowchart. Code your answer in an assembly language of your choice. (10 marks)

2.

a. With a labelled diagram,

i. explain 'Interrupt' as applied to microprocessors. (5 marks)

ii. describe how a 68000 microprocessor executes instructions. (5 marks)

b. In a 68000 system, the processor reads the status of a memory-mapped peripheral to determine whether or not a key has been pressed. If no key has been pressed, a branch is made back to the instruction that reads the status of the peripheral and the cycle continues until a key is pressed.
Write a 68000 program to show how this can be done. (10 marks)

3.

a. Draw and label the 68000 microprocessor. (5 marks)

b. The 68000 microprocessor pins are arranged in groups. List all of them. (5 marks)

c. Classify these pins based on their functions. (3 marks)

d. With the help of 74LS138 decoder, some NOR and NAND Gates, and a suitable diagram, explain how the following memory devices may be interfaced to the 68000 microprocessor: 'User data memory', 'User program memory' and 'Supervisor program and data memory'. (7 marks)

4.

a. List four (4) main differences between CISC and RISC microprocessor. (4 marks)

b. Briefly describe the following functions in the 68000 microprocessor:

i. A7 (4 marks)

ii. Control Unit (4 marks)

iii. ALU (4 marks)

iv. Indirect address register addressing (4 marks)

5.

a. List and explain any two (2) differences between partial address decoding and absolute address decoding. (4 marks)

b. Name and explain with an example how a third compromised address decoding can be used. (4 marks)

c. Name any two components you would need to realise (5a) above. (2 marks)

d. With the help of an address table illustrating partial address decoding, design and implement a partial address decoding scheme for the following devices: 4K ROM1, 8K RAM, 16K ROM2, 32K Peri1 and 64K Peri2. (10 marks)

6.

a. Use simple diagrams to explain the following:

i. Immediate addressing. (4 marks)

ii. Indirect address register addressing with post-incrementing. (4 marks)

b. Explain the three (3) main techniques used by DMA for effective computing. (3 marks)

c. A 68000 CPU has a clock frequency of 8 MHz, t_{CYC} = 125 ns, t_{CLAV} = 70 ns and t_{DICL} = 15 ns, calculate its maximum t_{ACC}. (5 marks)

d. Explain how the 68000 uses cache in its memory mangement. (4 marks)