ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

SEMESTER FINAL EXAMINATION **WINTER SEMESTER, 2017-2018**

DURATION: 3 Hours **FULL MARKS: 150**

CSE 4503: Microprocessors and Assembly Language

Programmable calculators are not allowed. Do not write anything on the question paper.

There are **8 (eight)** questions. Answer any **6 (six)** of them.

Figures in the right margin indicate marks.

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1. a) What do you mean by single and multi-core microprocessor systems? Briefly explain the importance of using assembly language in a microprocessor system. 10

   b) Derive the contents of the `Flag` (`CF, PF, ZF, OF`) register of `8086` microprocessor upon executing the following instructions: 8

   i. `CMP AL, FFh` ; Assume `AL` initially contains `FFh`.
   ii. `TEST AL, FFh` ; Assume `AL` initially contains `FFh`.

   c) Explain the purpose of `DUP` operator with an example. 7

2. a) Derive the contents of the following `MOV` instructions using its coding template and also show how the contents of the instructions can be stored in memory: 12

   i. `MOV AL, BL`
   ii. `MOV FFh[SI], BH`
   iii. `MOV DX, [ABCDh]`

   b) Write short differentiations between the following 8086 assembly language instructions: 8

   i. `ROR and SHR` ii. `LEA and OFFSET` iii. `NOT and NEG`

   c) Write an assembly language program structure to allocate exactly 64 Kbytes of memory for *data segment*, default memory bytes for *stack segment* and also consider that the size for *code segment* may exceed 64 Kbytes. 5

3. a) Draw the schematic architecture of 8088 microprocessor. Write short notes on *segment registers* of 8086 microprocessor. 9

   b) Write an assembly language program that takes N as a decimal digit (0 ~ 9) input and shows the summation of $1+2+ \ldots + N$ as output. 9

   c) Suppose, while debugging an assembly language program the values of the registers are: `Flag=FEB9h, IP=0102h, CS=0500h, SP=FFFCh`. Now, if `INT 21h` is requested, derive the memory addresses from where the new `IP` and `CS` can be retrieved; Also show the new `SP` value and steps involved in handling the interrupt by the 8086 microprocessor. 7

4. a) Drawing the timing diagram, briefly explain the `READ` and `WRITE` operations for `8086` microprocessor. 10

   b) Narrate the function of using `1`, `2` and `9` under `INT 21h` instruction. 6

   c) Distinguish between the followings: 9

   i. Polling and Interrupt.
   ii. Memory-mapped I/O and Isolated I/O.

5. a) Find out the similarity between the register sets of 8085 and 8086 microprocessors. 10
   b) Briefly explain the operations of IOPL and NT flags of 80286 microprocessor. 7
   c) To perform `MUL` and `DIV` operation, write two assembly language programs each for `MUL` and `DIV` using: 8
      i. 8086 Data Register Sets
      ii. 8086 Bit Manipulation Instructions

6. a) With an appropriate timing diagram clearly define the following terms: 9
   Clock cycle, *Machine cycle* and *Instruction cycle*.
   b) Differentiate between different `80x86` microprocessors. 9
   c) Derive the contents of the `IN AL, FFh` using the instruction template and also show how the contents of this instruction can be stored in memory. 7

7. a) What is Memory Segment? How is the main memory of 8086 processor segmented? 8
   b) Briefly explain the operations of a Program Counter. 8
   c) Write appropriate assembly language codes to accomplish the following tasks (use as many as possible arithmetic instructions with less number of registers): 9
      i. (30 + 15) * (575 – 225) + 210
      ii. 0Bh * (200 - 225) + 127
      iii. FFFh * 10h + 1111b

8. a) What are real mode, protected mode and virtual mode? Which microprocessor(s) first implements the virtual mode and how? 10
   b) Distinguish between the DX and SX version of 80386 microprocessor. 8
   c) Write an assembly language program structure to clearly state the operational differentiation between `LABEL` and `LOOP`? 7