ENCS336 - Second Exam

Question 4: (20 marks)

Given a CPU with the following resources:

AC: general-purpose register

A, B, C, D, Y: memory addresses containing numeric data.

Write 4 pieces of code to execute the expression [Y = (A + B) * (C - D)] using:

- a) Zero-address instructions
- b) One-address instructions
- c) Two-address instructions
- d) Three-address instructions

Instructions available to you are:

MOVE, STOR, ADD, SUB (subtract), MPY (multiply), PUSH, POP

A)	Comment	B)	Comment
PUSH A PUSH B ADD POP X PUSH C PUSH D SUB PUSH X MPY POP Y	T top of memory stack $T \leftarrow A$, $T++$ $T \leftarrow B$, $T++$ $T \leftarrow T_{-1} + T$ $X \leftarrow T$, T $T \leftarrow C$, $T++$ $T \leftarrow D$, $T++$ $T \leftarrow T_{-1} - T$ $T \leftarrow X$, $T++$ $T \leftarrow T_{-1} * T$ $Y \leftarrow T$, T	MOVE C SUB D STOR Y MOV A ADD B MYP Y STOR Y	AC ← C AC ← AC – D Y ← AC AC ← A AC ← AC + B AC ← AC * Y Y ← AC
MOVE Y, A ADD Y, B MOVE T, C SUB T, D MPY Y. T	Comment Y ← A Y ← Y + B T ← C T ← T – D Y ← Y * T	D) ADD Y, A, B SUB T, C, D MPY Y, Y, T	<u>Comment</u> Y ← A + B T ← C - D Y ← Y * T

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Question 5: (15 marks)

Assume that an 8086 style computer has an unlimited amount of memory. Each memory location is 16 bits (2 bytes) wide word. A word with address I contains a binary number equal to 2*I. So location number 50 has the binary number corresponding to 100, and location 170 has the binary number corresponding to 340, and location 6530 has the binary number corresponding to 13060, and so on. Assuming that AX has the initial value of 1000 and BX = 500, Show the value of AX after each of the following:

ADD AX, Z, where Z is

Operand
$$= A$$

$$AX \leftarrow 1000 + 1003 = 2003$$

$$EA = A = 1003$$

$$AX \leftarrow 1000 + 2006 = 3006$$

$$EA = (A) = (1003) = 2006$$

$$AX \leftarrow 1000 + 4012 = 5012$$

$$EA = R$$

$$AX = 1000 + 500 = 1500$$

5. Z=[BX] register indirect addressing

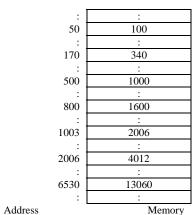
$$EA = (R) = 500$$

$$AX = 1000 + 1000 = 2000$$

6. Z=[BX]+300, base-offset addressing.

$$EA = (R+300) = 800$$

$$AX = 1000 + 1600 = 2600$$



	Registers
AX	1000
BX	500