CS2026 ASSIGNMENT 8 (Due Date: May 01, 2026)

Instructions: You have to answer all of them. Put your answers in a MS WORD file, or other word processing file, and then submit the file to the course Gmail account.

The instructions appeared in this assignment are based on the content presented in the Section 9 in the latest teaching material 'Processor and Computer' version 20260426.

In this assignment, IA and IB are the input registers to the 'ADD/SUB' unit and OUT is the output register of the 'ADD/SUB' unit.

Question 1

Refer to the artificial CPU and its commands, what will be the content of $M4$ if the following commands are executed?

```
DEF M1 0
DEF M2 2
DEF M3 5

MOV IA M1
IF IA == 0
   MOV IA M2
   MOV IB M3
   ADD IA IB
   MOV M4 OUT
ELSE
   MOV IA M1
   MOV IB M2
   ADD IA IB
   MOV M4 OUT
ENDIF
```

Answer:

(a) 2.

(b) 7.

(c) 5.

(d) 0.

Question 2

What will be the content of $M4$ if the following program segment is executed?

```
DEF M1 16
DEF M2 22
DEF M3 10
MOV IA M1
MOV IB M2
CMP IA IB
MOV M4 OUT
MOV IA M2
MOV IB M3
CMP IA IB
MOV IA OUT
MOV IB M4
ADD IA IB
MOV M4 OUT
```

Answer:

(a) 28.

(b) 30.

(c) 32.

(d) 34.

Question 3

Refer to the artificial CPU and its commands, what will be the content of $M4$ if the following commands are executed?

```
DEF M1 0
DEF M2 2
DEF M3 5

MOV IA M1
IF IA == 0
   MOV IA M2
   SHL IA 00000100
   MOV IA OUT
   MOV IB M2
   ADD IA IB
   MOV M4 OUT
ELSE
   MOV IA M3
   SHL IA 00000100
   MOV IA OUT
   MOV IB M3
   ADD IA IB
   MOV M4 OUT
ENDIF
```

Answer:

(a) 4.

(b) 6.

(c) 8.

(d) 10.

Question 4

Three numbers have been stored in M1, M2 and M3. Which of the following program segments can correctly give the output of the following formulae?

$$M4 = M1 + M2 \times M3.$$

Answer:

(a)
```
----------------
MOV IA M1
MOV IB M2
MUL IA IB
MOV IA OUT
MOV IB M3
ADD IA IB
MOV M4 OUT
----------------
```

(b)
```
----------------
MOV IA M1
MOV IB M2
ADD IA IB
MOV IA OUT
MOV IB M3
MUL IA IB
MOV M4 OUT
----------------
```

(c)
```
----------------
MOV IA M2
MOV IB M3
MUL IA IB
MOV IA OUT
MOV IB M1
ADD IA IB
MOV M4 OUT
----------------
```

(d)
```
----------------
MOV IA M2
MOV IB M3
ADD IA IB
MOV IA OUT
MOV IB M1
MUL IA IB
MOV M4 OUT
----------------
```

Question 5

Given that there are five memories M1, M2, M3, M4 and M5. Here is the program segment to instruct the circuit.

```
----------------
MOV IA M1
MOV IB M2
MUL IA IB
MOV M5 OUT
MOV IA M3
MOV IB M4
MUL IA IB
MOV IA OUT
MOV IB M5
ADD IA IB
MOV M5 OUT
----------------
```

Which of the following mathematical equation is identical to the operation of the following program segment?

Answer:

(a) $M5 = M1 + M2 \times M3 + M4.$

(b) $M5 = (M1 + M2) \times M3 + M4$

(c) $M5 = M1 \times (M2 + M3) \times M4.$

(d) $M5 = M1 \times M2 + M3 \times M4.$

Question 6

Given that there are five memories M1, M2, M3, M4 and M5. Here is the program segment to instruct the circuit.

```
----------------
MOV IA M1
MOV IB M2
MUL IA IB
MOV IA OUT
MOV IB M3
MUL IA IB
MOV IA OUT
MOV IB M4
SUB IA IB
MOV M5 OUT
----------------
```

which of the following mathematical equation is identical to the operation of the following program segment?

Answer:

(a) $M5 = M4 - M1 \times M2 \times M3.$

(b) $M5 = M4 - (M1 + M2) \times M3$

(c) $M5 = M1 \times M2 \times M3 - M4.$

(d) $M5 = (M1 + M2) \times M3 - M4.$

Question 7

If the content in $M1$ is either '1' or '0', which of the following mathematical equation is identical to the operation of the following program segment?

```
MOV IA M1
IF IA == 0
   MOV IA M2
   SHL IA 00000100
   MOV IA OUT
   MOV IB M2
   ADD IA IB
   MOV M4 OUT
ELSE
   MOV IA M3
   SHL IA 00000100
   MOV IA OUT
   MOV IB M3
   ADD IA IB
   MOV M4 OUT
ENDIF
```

Answer:

(a) $M1 \times (9 \times M2) + (1 - M1) \times (9 \times M3)$.

(b) $M1 \times (5 \times M2) + (1 - M1) \times (5 \times M3)$.

(c) $(1 - M1) \times (9 \times M2) + M1 \times (9 \times M3)$.

(d) $(1 - M1) \times (5 \times M2) + M1 \times (5 \times M3)$.