İ.T.Ü. Faculty of Computer and Informatics – Microprocessor Systems Midterm 1
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Time: 120 mins.

Student #	Name	Signature

Q1	Q2	Q3	Q4
25 %	30 %	30 %	15 %

Do Not Use Any Reference Other Than the Approved Printouts
Write your name on all answer sheets
Good Luck

Q1) A sample program for the Educational-CPU is provided below in machine code and the asssembler. The contents for some of the registers and memory contents before executing the program are provided in the below table.

a. Fill-in the Program Counter (PC) column for each instruction, and the (a), (b), (c), (d) fields.
b. Complete the table for memory addresses and registers with their updated contents after the program execution.
c. In order to execute the instruction in Step 14, how many memory read and how many memory write operations should be made?

Step	PC	Machine Code	Assembler		
1	0010	20 05 0F FF	START	YÜK	SK, 0FFF (a)
2	0014	70 45		ART	SK
3	0016	4B 42		SİL	C
4	0018	50 42 (b)		ART	C
5	001A	00 80 00 01		YÜK	A, <SK+$00>+01
6	001E	00 81 00 01	REW	YÜK	B, <SK+$00>+01
7	0022	50 42		ART	C
8	0024	43 01		TOP	A,B
9	0026	89 02 (c)		DTV	FWD
10	0028	80 F4 (d)		DAL	REW
13	002A	01 80 00 01	FWD	YAZ	A, <SK+$00>+01
14	002E	01 62 00		YAZ	C, <SK+$00>
15	0031	C3		SON	KES

a) 0FFF b) 50 c) 02 d) F4

Mem. Address or Register	Data (Before program execution)	Data (After program execution)
A	AA	DD
B	AA	7F
C	AA	03
D	AA	—
SK	A000	1004
0FFF	15	—
1000	25	—
1001	39	—
1002	7F	—
1003	80	DD
1004	81	03
1005	82	—
1006	83	—
1007	84	—

c) 3 memory read, 1 memory write

~~Q1) Explain briefly the main features that characterize the capabilities of a CPU.~~

SK	A	B	C
OFFF	25	39	00
1000	5E	7F	01
1001	DD		02
1002			03
1003			
1004			

```
  25    A
+ 39    B
----    ↓
  5E    A
```

```
  5E    A
+ 7F    B
----
  DD    A
```

T = 1

Taşma (2'li tümleyen)

overflow (2's complement)