

**CENG 311 COMPUTER ARCHITECTURE
2014-2015 FINAL EXAM**

Duration: 1.5 hours

Q1 (20 pts) The following code is an excerpt from the implementation of a microprocessor in VHDL.

- a) Please explain which part of the microprocessor can this code associate to?
- b) What does "push <='1'" perform?
- c) What does "inta <='1'" perform?

```
when s_fetch =>
    if(int='1') then
        state <= s_int;
        inta<='1';
    elsif(int='0') then
        state<= s_decode;
        inta<='0';
    end if;

when s_int=>
    push <='1';
    ...
```

Q2 (20 pts) The source codes below constitute one executable code (using "gcc sample.s sample.c -o sample -masm=intel -lm"). During run-time of the program, what would be the content of EAX register at point L1? Explain your answer.

```
sample.s:
main: ...
    push 5
    push 12
    push 9
    call func
    pop ebx
    add eax, ebx
L1:    ... ; eax=?
```

```
sample.c:
#include<math.h>
struct A{
    int x, y;
};
int func(struct A a)
{
    return sqrt(a.x*a.x+a.y*a.y);
}
```

Q3 (20 pts) Write the function prototyped below in assembly language that searches a letter (char c) in a text (char *text). If found, return value should be 1, else 0.

```
int searchChar(char *text, char c);
```

Q4 (20pts) We want to connect three memory chips, which are 2 kbytes, 4 kbytes and 8 kbytes in size, to a microprocessor that has 32 bit address bus. Please design an address decoder circuit (you can use partial address decoding).

Q5 (20pts) What aspect of uPabs directly affects the number of nested calls that can be made? Explain your reasoning.