Bangladesh University of Engineering and Technology

CSE 316 January 2021, Final Quiz

Total Marks: 45, Time: 40 minutes (+10 for submission)

Part 1: MCQ (Google Form) **1 x 15 = 15**

Part 2: Short Questions **5 x 6 = 30**

Question 1:

You are given the following assembly code segment. Make necessary modifications to make it print the value x − 2y.

```
.MODEL SMALL
.STACK 100H
.DATA
      CR    EQU 0DH
      LF    EQU 0AH
      X     DW ?
      Y     DW ?
      Z     DW ?
.CODE

MAIN PROC
      MOV AX, @DATA
      MOV DS, AX

      MOV AH, 1
      INT 21H
      SUB AL, 0
      MOV X, AX

      MOV AH, 1
      INT 21H
      SUB AL, 0
      MOV Y, AX

      MOV AH, 2
      MOV DL, CR
      INT 21H
      MOV DL, LF
      INT 21H

      MOV AX, X
      MOV BX, 2
      MUL BL
      MOV BX, AX
      MOV AX, Y
      SUB AX, BX
      MOV Z, AX
      MOV DX, Z
      ADD DX, 0
      MOV AH, 2
      INT 21H

      ;DOS EXIT
      MOV AH, 4CH
      INT 21H

MAIN ENDP
END MAIN
```

Question 2:

In tropical geometry (a branch of mathematics), tropical addition (⊕) and multiplication (⊗) operations are defined as follows:

$$x \oplus y = \min(x, y)$$

$$x \otimes y = x + y$$

Assume you have two signed integers x and y in AX and BX. Write an assembly code segment that will compute $x \oplus y$ and $x \otimes y$ and store them in AX and BX respectively. You can ignore overflow.

Question 3:

What will be the output of the following assembly code? Note that the following code is a running code having no error.

```
section .text
global _start ;must be declared for using gcc
_start: ;tell linker entry point

mov ecx, [num1]
cmp ecx, [num2]
jg check_third_num
mov ecx, [num2]
check_third_num:
cmp ecx, [num3]
jg _exit
mov ecx, [num3]
_exit:
mov [result], ecx
mov ecx,msg
mov edx, len
mov ebx,1 ;file descriptor (stdout)
mov eax,4 ;system call number (sys_write)
int 0x80 ;call kernel
mov ecx,result
mov edx, 2
mov ebx,1 ;file descriptor (stdout)
mov eax,4 ;system call number (sys_write)
int 0x80 ;call kernel
mov eax, 1
int 80h

section .data
msg db "Result is: ",
len equ $- msg
num1 dd '22'
num2 dd '31'
num3 dd '47'
segment .bss
result resb 2
```

Question 4:

Using recursion, write an assembly program which takes a positive integer n as input, and prints all positive integers from 1 to n in descending order.

```
Sample input: 5

Sample output: 5 4 3 2 1
```

Question 5:

Suppose you have an active low switch S and two LEDs L1 and L2 connected with your ATmega32. Initially L1 is ON and L2 is OFF. You need to toggle L1 and L2 whenever S is pressed. Draw the circuit diagram and write necessary C code to perform the task. [Handle the press of S with external interrupt one(1)]

Question 6:

Suppose, for ATmega32, ADC is right justified, internal 2.56V is reference. Input voltage varies between 0V-2.56V. What is the maximum error if only ADCH is read?

Helping Materials

<table>
<tr><th>Register Name</th><th>Configuration</th></tr>
<tr><td>GICR</td><td>
<table>
<tr><td>INT1</td><td>INT0</td><td>INT2</td><td>-</td><td>-</td><td>-</td><td>IVSEL</td><td>IVCE</td></tr>
</table>
</td></tr>
<tr><td>MCUCR</td><td>
<table>
<tr><td>-</td><td>-</td><td>-</td><td>-</td><td>ISC11</td><td>ISC10</td><td>ISC01</td><td>ISC00</td></tr>
</table>
Trigger codes: 00 → low level, 01 → any logical change, 10 → falling edge, 11 → rising edge
</td></tr>
<tr><td>MCUCSR</td><td>
<table>
<tr><td>JTD</td><td>ISC2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>
ISC2: 0 → falling edge trigger, 1 → rising edge trigger
</td></tr>
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