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| **Cairo University** | **CMP201A** | **Total:75 Points** |
| **Faculty of Engineering** | **Microprocessor Systems** | **2017-2018** |
| **Computer Eng. Department** | **Final Exam** | **Two Hour** |

**This is an open-book, open notes exam. All electronic devices - Except calculators - are forbidden.  
Make any reasonable assumptions (if necessary)   
Answer the following questions**

**Q1- [4] Using the following data definition, allocate syntax errors and write V(Valid) or I (Invalid) for each of the following instructions**

X db 2

C equ 12

|  |  |  |
| --- | --- | --- |
|  | **Instruction** | **V/I** |
| 1 | MOV X, C | V |
| 2 | MOV 4[SI-1],C+12 | V |
| 3 | SUB [SI],[DI] | I |
| 4 | CLC AX | I |
| 5 | JMP [BX] | V |
| 6 | @a?@$: mOv bX,2171H | V |
| 7 | DIV AX,BX | I |
| 8 | ADD X, [C] | I |

**Q2-[14] Write a single instruction for each of the following operations. Note that no other changes should occur.**

1. [1] Subtract the carry flag from BH

SBB BH,0

1. [1] Divide signed number in AX by cl

IDIV CL

1. [1] Declare three bytes starting at location V with all bits are set

V db 0FF, 0FF, 0FF

1. [1] subtract the content of DX from CX

SUB CX, DX

1. [1]change the content of DH to change the parity

XOR DH,1

**With two different methods, Write a single instruction for each of the following operations.**

1. [2] Subtract Three from BL

ADD BL,-3 || SUB BL, 3

1. [2] define uninitialized 4 bytes variable x

X DD ? **|| X DW ?, ? or X DB ?,?,?,?**

1. [2] Multiply the content of CX by 4

SHL CX,2 || SAL CX,2

1. [2] Clear the content of AX

MOV AX,0 || XOR AX,AX or SUB AX,AX

1. [2] Add Zero to the content of AX without logical or arithmetic instruction

||

**Q3-[4] What is the addressing mode for the following [Note: it may be invalid]**

|  |  |
| --- | --- |
| 1. MOV DX, BX | **Register** |
| 1. MOV EAX, [DI+2] | **Indexed** |
| 1. MOV EDX, 6+2 | **Immediate** |
| 1. MOV CX,[BX][BP]+1 | **invalid** |

**Q4-[4] Choose Synchronous or Asynchronous Serial communication for each of the following situations by putting (√) under your choice**

|  |  |  |
| --- | --- | --- |
|  | **Synchronous** | **Asynchronous** |
| 1. Sending 1000 pages to the printer for printing |  | **1** |
| 1. Sending large amount of data between two PCs | **1** |  |
| 1. Calling your friend using landline | **1** |  |
| 1. Sending “Call Me” to your friend |  | **1** |

**Q5-[6] What is the content of: *[Note: Put a single hexadecimal digit per cell]***

***[4] AX after each line of the following***

.MODEL SMALL

.DATA

x dd 4

y dw 5

z db 2

m equ 9

.code

MAIN PROC FAR

MOV AX,@DATA

MOV DS,AX

MOV AX,0

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| MOV AX, Byte PTR Y+2 | **AX=** | 0 | 0 | 0 | 2 | H |
| ADD Y+1, AX | **AX=** | 0 | 0 | 0 | 2 | H |
| INC AH | **AX=** | 0 | 1 | 0 | 2 | H |
| ADD AX,m-1 | **AX=** | 0 | 1 | 0 | A | H |

MAIN ENDP

END MAIN

|  |  |  |  |
| --- | --- | --- | --- |
| **AL=** | 0 | 7 | H |

***[2] What is the content of al after executing***

MOV AX, 4

MOV CX, 012H

XOR AL, CH

LOOP1:

ADD AL, 1

INC CL

SUB CX, AX

LOOP LOOP1

**Q6 [8] fill in the spaces**

1. [1] The number of address bus lines needed for 2 Mega addressable locations =
2. [1] The number of data bus lines required to transfer four bytes at a time=
3. [2] The following program part starts at memory location 100H

MOV AL, 57

MOV AL, 32

Assuming that memory location 100H contains 57H and memory location 101H contains 57H, The

content of memory locations 102H= …………… H and Memory location 103=……………H

1. [4] The minimum required time to transfer 1 GIGA bytes of data between two devices at a distance

of 1000 feet =……………

**Q7 [10] assume that DS=1111H CS=2222H SS=3333H IP=4444H BP=5555H SP=6666H BX=7777H SI=8888H DI=9999H**

1. [2] What is the accessed physical memory address for each of the following?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| MOV AX,[BP][SI]+1 | PA= |  |  |  |  |  | H |
| MOV AX,3[BP] | PA= |  |  |  |  |  | H |

1. [6] What is the current physical address , lower range physical address and upper range physical address of both code segment and data segment, assuming BX is the offset

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Current physical address** | **Lower range physical address** | **Upper range physical address** |
| **Code Segment** |  |  |  |
| **Data Segment** |  |  |  |

1. [2] Is the data and code segments overlapped or not?

**Q7 [6] Indicate if the statement is True or False by writing TR or FL, [*2 Wrong Answers will Eliminate 1 Correct]***

|  |  |
| --- | --- |
| It is always better to use parallel communication for low distances less than 5 m |  |
| To transfer a lot of data asynchronous transmission is better than synchronous one |  |
| Full duplex is always better than half-duplex communication mode for two-way communication |  |
| Serial transmission prefer two or three stop bits for slow computers |  |
| Even for a very stable connection in a non-noisy environment, it is preferred to add parity bit for serial transmission |  |
| Before sending data, it is required to check the status of Transmitter shift Register |  |

**Q8 [10] Find ten different commands that will never result of ax value to be incremented by two using one line [Hint: INC command never increase AX by two in one line, find other ten commands other than inc]**

1. ROR,RCR,SHR,SAR,TEST,CMP,DEC,HLT,OUT,OUTSB

**Q9 [10] Implement the following macros**

Reads 8 bits binary number from the keyboard and put it in one-byte variable.

Calculates number of zeros in a given one-byte variable and output the number of ones at port 378h

Draws a diagonal line starting from the upper left pixel of the screen

Use string operation to check if the first 6 letters of STR1 and STR2 are matched or not

Q10 [6] Design overflow, zero, parity and sign flags