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| **Cairo University** | **CMPN201** | **Total:80 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 EDX,SI |  |
| 2 | MOV SS, X |  |
| 3 | MOV ES,C |  |
| 4 | MUL BL,3 |  |

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

1. [1] Declare a static variable n with value 34h
2. [1] Add the carry flag to ah
3. [1] Copy the content of ax to bx
4. [1] Multiply two signed numbers saved in AX and CX

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

1. [2] Add five to the content of ax

||

1. [2] Define 16 bits variable y and initialize by 6

**||**

1. [2] Define unlabeled 100 bytes with all bits are ones

||

1. [2] Add the content of memory location with offset stored in BX to the content of AL

||

1. [2] Swap dl and dh

||

**Q3-[4] What is the addressing mode for the following**

|  |  |
| --- | --- |
| 1. MOV AX, VAR |  |
| 1. MOV BX, [SI]+2 |  |
| 1. MOV EDX, 12 |  |
| 1. MOV EDI, EBX |  |

**Q4-[4] Choose Macro or procedure for each of the following situations by putting (√) under your choice**

|  |  |  |
| --- | --- | --- |
|  | **Macro** | **Procedure** |
| 1. Minimize assembling time |  |  |
| 1. Minimize the program size |  |  |
| 1. Optimize the runtime in general |  |  |
| 1. Optimize the runtime for small (proc/macro) with too many calls |  |  |

**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

.code

MAIN PROC FAR

MOV AX,@DATA

MOV DS,AX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| MOV AX,WORD PTR X+3 | **AX=** |  |  |  |  | H |
| ADD AX, Y+1 | **AX=** |  |  |  |  | H |
| INC AH | **AX=** |  |  |  |  | H |
| ADD AX, Z-1 | **AX=** |  |  |  |  | H |

MAIN ENDP

END MAIN

|  |  |  |  |
| --- | --- | --- | --- |
| **AL=** |  |  | H |

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

MOV AL, 0

MOV CX, 0CH

LOOP1:

ADD AL, 1

DEC CL

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] Use any assumptions to find one line that result of ax value to be incremented by two with ten different commands [Hint: assuming AX=2 and BX=2 then “*MUL BX*” may be a solution, find 10 possible solutions other than MUL]**



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

Displays "It costs 50$ only" on the screen

Draws a vertical line at the center of screen

Use string operation to copy the first 6 letters of STR1 to STR2

Use string operation to search for letter "D" in string STR

Q10 [6] A washing machine is able to do the following tasks

Open valve (to fill tank with water)

Start Pump (to empty tank)

It has two pins. One for each task (1:start/0:stop). It has 2 other pins that determine water status S1 and S2 (00: Empty, 01: 0.25, 10:0.5 and 11: Full).

It is required to design a washing machine interfacing circuit that takes the following commands

0:Empty\_tank

1:Fill\_tank

You have only five gates at maximum



S2

S1

Start Pump

Open valve