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| **Cairo University** | **CMPN201 / CMP201A** | **Total:60 Points** |
| **Faculty of Engineering** | **Microprocessor Systems** | **2019-2020** |
| **Computer Eng. Department** | **Midterm Exam**  | **One 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 – (5) Indicate if the statement is True or False (signs like is not accepted)**

|  |  |
| --- | --- |
| 1. Register indirect addressing mode is slower than register addressing mode because **it accepts registers BX,SI and DI only**
 | ***FL*** |
| 1. General purpose registers AX,BX,**SI** and DX cold be accessed as either 16/8-bit registers
 | ***FL*** |
| 1. Assembly memory variables could be accessed by other variables names
 | ***TR*** |
| 1. Increasing **register size only**, increases the data transfer rate
 | ***FL*** |
| 1. The CMP instruction **alters** the contents of its operands
 | ***FL*** |

**Q2 – (6) Complete the following statements**

1. [2] Assuming that BX=1234H,DX=2323H,SI=3434H,DI=4365H,IP=87F4H,BP=8721H,DS=821H, CS=32H ,SS=7632H and the current command is “Push SI”, then the physical address of the current command is **CS:IP**=**00320H+087F4H=08B14H**
2. [2] To display a string using INT 21H, The last character of this string must be **$**
3. [2] In assembly, Memory to memory instructions are (slower than- faster than – equal to – none of the above) **none of the above** register to register instructions (**Note: it is invalid**)

|  |  |  |
| --- | --- | --- |
| 1 | MODEL SMALL |  **Q3(10) - [4] What does the program on the left side do?** |
| 2 | .CODE | Drawing with mouse |
| 3 | MAIN PROC FAR |
| 4 |  MOV AX,13H |
| 5 |  INT 10H | **[2] If we commented the line number ( 8 ), will it change the program functionality[ yes / no ] ?** |
| 6 |  L1:MOV AX,3 |
| 7 |  INT 33H  | Yes |
| 8 |  AND BL,BL |
| 9 |  MOV AX,0C00H |
| A |  JZ L2  | **[4] If yes, what is the effect? And if no, why doesn't it change the functionality?** |
| B |  ADD AL,0FH |
| C |  L2:INT 10H | Keep drawing without click |
| D |  JMP L1 |
| E | MAIN ENDP |
| F | END MAIN |

 **Q4 – (12) Assuming that, the initial state is always AX=34H,BX=101H, and CX=5608H**

1. [6]In one line with six different methods, copy the content of AL to AH (without affecting AL content)

**MOV AH,AL/ mov ax,3434h**

**XOR AH,AL**

**OR AH,AL**

1. …….……………………….. 2- ….………………………….. 3-….…………………………..

**ADD AH,AL/Add Ah,3400h**

**MUL BX/ IMUL BX**

**Sub ax,0cc00h**

1. …….……………………….. 5- ….………………………….. 6-….…………………………..
2. [6] In one line with six different methods, move the content of AL to AH (clearing AL content)

**Add ax,33cch/sub ax,0cc34h**

**XCHG AH,AL**

**SHL AX,CL/ SAL AX,CL**

1. …….……………………….. 2- ….………………………….. 3-….…………………………..

**ROL AX,CL**

**MOV AX,3400H**

1. …….……………………….. 5- ….………………………….. 6-….…………………………..

**ROR AX,CL**

[*Hint: Your commands may be valid only for this case*]

**Q5 – A[10] - Hany is a cheater programmer. He is paid by the number of lines he wrote. The quality assurance testing team always find useless lines in Hany’s code. Help them to detect at least TEN useless lines in the following code. Fill in squares in front of useless lines that could be deleted safely without changing final result saved in DX in line 19. Discard black squares :**

[**Hint**: DX is used at the end of the program to hold the final result only ]

|  |  |  |  |
| --- | --- | --- | --- |
| **#** | **Command** |  | **Reason** |
| 1 | .MODEL SMALL  |  |  |
| 2 | .STACK 64 | **√** | There is no push, pop or call. Let’s remove it |
| 3 | .DATA | **√** | Only one non used variable. Remove it also |
| 4 | VAL DB 4 | **√** | This is the variable. It never been called. Remove it |
| 5 | .CODE |  |  |
| 6 | MAIN PROC FAR |  |  |
| 7 |  MOV AX,@DATA | **√** | As there is no data segment, remove it also |
| 8 |  MOV DS,AX | **√** | And this one |
| 9 |  MOV BX,9 |  |  |
| A |  MOV CX,0  |  |  |
| B |  CMP CX,0 | **√** | No meaning for comparing cx with zero. It already equal zero in the previous line. Therefore, this comparison will be always true |
| C |  JZ L3 | **√** | And will jump to L3 always |
| D |  L3:AND CX,CX | **√** | That is the L3 which is directly after the jump line. Let’s remove all of the three lines.it always jump to a line that to nothing before continue |
| E |  L1:MOV AX,CX |  |  |
| F |  MUL CX |  |  |
| 10 |  MOV DX,BX | **√** | Making any change to DX is useless. As it never been used unless at the end of the program (remember the hint). If we traced DX it never been used. Therefore, this change is useless |
| 11 |  CMP AX,BX |  |  |
| 12 |  MOV AX,AX | **√** | This is direct useless line. It totally do nothing |
| 13 |  JZ L2  |  |  |
| 14 |  XOR DX,DX | **√** | Here, DX is cleared. We don’t need it also for the same reason. |
| 15 |  ADD BX,DX  | **√** | DX is added to BX. However, DX is currently equal zero. Which means, it is useless also |
| 16 |  INC DX | **√** | Again, it is incremented. |
| 17 |  INC CX  |  |  |
| 18 |  JNZ L1 |  |  |
| 19 | L2: MOV DX, CX  |  | And all what we did for DX is cleared here. Therefore, all other DX commands are useless |
| 1A | HLT |  |  |
| 1B | MAIN ENDP |  |  |
| 1C | END MAIN |  |  |

**B – [2] What does this code do?**

Find the square root of 9

**C – [2] They complained to their boss. “If you found more than a dozen [12] of useless lines, FIRE HIM” He replied. will he be fired [Yes / No]?**

YES

**D – [9] Hany always says that “I’m smart not cheater”. Prove that you are much smarter, and you are able to write NINE different commands that DO NOTHING. [Ignoring flag, IP and CS registers status after command – DO NOT make any other assumptions]**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| JMP C | JE C | JZ C | JCXZ C | JP C | JPE C |
| JLE C | JNG C | JNGE C | JNL C | JNLE C | JO C |
| JAE C | JB C | JBE C | JNA C | JNAE C | JNB C |
| JNE C | JNZ C | JECXZ C | JNP C | JPO C | JA C |
| JNO C | JS C | JNS C | STD |  CLC |  STC |
| JNBE C | JC C | JNC C | JG C | JGE C | JL C |
| AND AX,AX | ADD AX,0 | SUB AX,0 | XCHG AX,AX | MOV AX,AX | CMP AX,BX |

**E - [4] Finally, They fired him. (may be for the current case or later). His team found a piece of code that seems to be garbage. Help them to rearrange the code to find the maximum of five numbers.**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| .CODE | 4 | JA G MOV AL,[BX+1] | 11 | MOV BX, OFFSET ARR | 8 | MOV AL,[BX]MOV CX,5 | 9 |
| ARR DB 2,3,1,5,4 | 3 | END MAIN | 16 | .DATA | 2 | MAIN PROC FAR | 5 |
| .MODEL SMALL | 1 | MOV AX, @DATA | 6 | MAIN ENDP | 15 | HLT | 14 |
| MOV DS,AX | 7 | C: CMP AL,[BX+1] | 10 | LOOP C  | 13 | G: INC BX | 12 |