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Air University
Department of Cyber Security
(Mid-Term Examination: Fall 2024)

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Student Sign: Bilal Badar

Subject: Computer Organization and Assembly Language
Class: BS-Cyber Security
Code: CS-226
Section: A & B
FM Name: Ms. Maryam Malik
FM Signature: ....

Total Marks: 50
Time:
Date:
Max Duration: 2 Hours

HoD Signature: ....

Instructions:

- You are required to attempt **ALL Questions.**
- This is a closed book/notes exam.
- **Return question paper with the answer sheet**

Q. No	Questions	CLO	Marks
1	a) Justify the following statement with example. "MASM does not prevent you from initializing a WORD with a negative value, but it's considered poor style." Why? b) Write the real number -6.2×10^4 as a real number literal using MASM syntax. c) How does the processor ensure that different programs running in protected mode do not interfere with each other's memory? d) Explain the concept of SIMD and how MMX registers utilize this feature.	1	10
2	You are optimizing an image rendering application that takes 100 minutes to render a high-resolution image using a single processor. 75% of the rendering time is spent on parallel tasks (rendering individual pixels). 25% of the rendering time is spent on sequential tasks (loading the image data, saving the final output, etc.). You upgrade the system to use 5 processors for the parallel tasks. 1. What will be the new total rendering time after the upgrade to 5 processors? 2. What is the speedup achieved with the 5 processors? 3. If the sequential part of the task is optimized to be 30% faster, what will the new total rendering time be after the optimization?	2	10

4. Based on Amdahl's Law, explain why adding more processors beyond 5 may not significantly improve performance and show what would be the maximum speed.

3

a. **Update** values of the flags **CF, OF, ZF, SF, PF, AF** after execution of each block which are part of a single program and write answers with reasoning.

3 30

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.code
;block 1
mov al, 11001100b
mov bl, 00110011b
add al, bl

;block 2
mov bl, 01111111b
add al, bl
```

b. **Analyze** the following assembly code, comment every line to explain its execution. Make useful corrections if required Also, indicate the state of registers and variables after each instruction.

Code	Comments and execution
.data number1 DWORD 10 number2 DWORD 20 sum DWORD 0 result WORD .code main PROC mov ax, number1 mov , ebx number2 add al, ebx mov result, al add sum, result INVOKE ProcessExit main ENDP END main	

c. Implement the following arithmetic expression in x86 MASM assembly language. Assume that val1, val2, val3, and val4 are 32-bit integer variables with the immediate values of 7, 14, 28, and 3, respectively also discuss the answer at the end.

Result = -2(val1) – val2 + (10 – val3) + val4

*********************End of Paper *********************