



Midterm. Exam 02

Academic Year 1447 - Second Semester

Exam Information معلومات الامتحان		
Course name	تنظيم وبناء الحاسب	اسم المقرر
Course Code	COE 224	رمز المقرر
Exam Date	26 / 4 / 2026	الأحد
Exam Time	12:00 – 13:00	وقت الامتحان
Exam Duration	1 Hour	مدة الامتحان
Classroom No.	GF 16	رقم قاعة الاختبار
Instructor Name	Prof. Dr. Mostafa Elhosseini	اسم استاذ المقرر
Student Information معلومات الطالب		
Student's Name		اسم الطالب
ID number		الرقم الجامعي
Section No.		رقم الشعبة
Serial Number		الرقم التسلسلي

General Instructions:

تعليمات عامة:

- Your Exam consists of 3 PAGES (except this paper) (بإستثناء هذه الورقة) عدد صفحات الامتحان 3 صفحة.
- Phones and smart devices are forbidden inside the hall. يمنع استخدام الهواتف والأجهزة الذكية داخل القاعة.

هذا الجزء خاص بأستاذ المادة

This section is ONLY for instructors.

#	Course Learning Outcomes (CLOs)	Related Question (s)	Points	Final Score
4	Analyze, develop, and test MIPS assembly language programs	Q1	10	
5	Design the datapath of a single-cycle processor	Q2 – Part A	5	
6	Design the datapath of a pipelined processor and handle hazards	Q2 – Part B	5	

Question 1: Points: 10**CLO #4**

For MIPS Architecture, answer the following MCQs.

1. What is the value of \$t2?

```
li $t0, 10
li $t1, 4
sub $t2, $t0, $t1
```

A. 6

B. 14

C. -6

D. 40

2. What is the output?

```
li $a0, 7
li $v0, 1
syscall
```

A. 0

B. 1

C. 7

D. Error

3. What does
- beq**
- do?

A. Jump always

B. Branch if equal

C. Branch if not equal

D. Load value

4. What does
- j**
- label do?

A. Conditional jump

B. Function call

C. Unconditional jump

D. Load address

5. What does
- .data**
- section store?

A. Instructions

B. Registers

C. Variables

D. Labels only

6. Which instruction
- loads a word from memory**
- ?

A. sw

B. lw

C. la

D. li

7. In MIPS, how can you implement
- NOT \$t1**
- ?

A. and \$t0, \$t1, \$t1

B. nor \$t0, \$t1, \$zero

C. or \$t0, \$t1, \$zero

D. xor \$t0, \$t1, \$t1

8. What is the result of:

```
li $t0, 0b1101
li $t1, 0b0101
and $t2, $t0, $t1
```

A. 1111

B. 1001

C. 0101

D. 0001

9. What is the purpose of using
- AND**
- in:
-
- and \$t0, \$t1, 0xFF**

A. Flip bits

B. Clear upper bits

C. Add numbers

D. Shift left

10. Which instruction
- sets the lowest bit of \$t0 to 1**
- ?

A. and \$t0, \$t0, 1

B. or \$t0, \$t0, 1

C. xor \$t0, \$t0, 1

D. nor \$t0, \$t0, 1

Question 2: Points: 10**CLO #5,6****Part A: Points 5****CLO #5**

In MIPS architecture, R-type instructions are encoded using a 32-bit format consisting of the following fields: opcode (6 bits, always 0 for R-type), rs (5 bits, first source register), rt (5 bits, second

source register), rd (5 bits, destination register), shamt (5 bits, shift amount, assume 0 for add), and funct (6 bits, determines the operation). The register mapping is given as follows: \$s0 = 16 (10000), \$t2 = 10 (01010), and \$t4 = 12 (01100). The function code for the add instruction is 32 (100000).

Given the MIPS instruction **add \$s0, \$t2, \$t4**, construct the complete **32-bit machine code in binary**, and finally convert the result into **hexadecimal format**.

00000001010011001000000000100000
0x014C8020

Part B: Points 5 CLO #6

- | | |
|--|---|
| <p>11. What is the main goal of pipelining?</p> <ul style="list-style-type: none">A. Reduce instruction sizeB. Increase clock frequency onlyC. Improve throughput (more instructions per unit time)D. Reduce number of registers <p>12. A structural hazard occurs when:</p> <ul style="list-style-type: none">A. Two instructions need the same hardware resource at the same timeB. One instruction depends on anotherC. A branch changes program flowD. Instruction format is incorrect <p>13. Which unit performs arithmetic operations in the datapath?</p> | <ul style="list-style-type: none">A. Register FileB. ALUC. MemoryD. Control Unit <p>14. In pipelining, multiple instructions:</p> <ul style="list-style-type: none">A. Execute sequentiallyB. Execute partially in parallelC. Execute randomlyD. Execute only one at a time <p>15. The hazard detection unit is responsible for:</p> <ul style="list-style-type: none">A. Performing ALU operationsB. Detecting hazards and inserting stallsC. Accessing memoryD. Writing result |
|--|---|

Best Wishes



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