

International Islamic University Chittagong
Department of Computer Science & Engineering
B. Sc. in CSE Semester Final Examination, Autumn 2018
Course Code: CSE 3503 Course Title: Computer Architecture
Total marks: 50 Time: 2 hours 30 minutes

[Answer any two questions from **Group-A** and any three questions from **Group-B**]

Group-A

- What are the basic elements of building data paths? Design a single cycle implementation of MIPS. 4
- Build a data path that can execute branch type instructions. 3
- Define exception. What are the two major types of exceptions. Explain. 3
- Describe the working procedure of each of the multiplexors used in single cycle data. 5
- Assume that the operation time for the major functional units such as memory units (200 picoseconds (ps)), ALU and Adders (100 ps), Register file (25 ps), Multiplexors (75ps) and remaining units has no delay. Also, assume following instruction mix: 25% loads, 25% stores, 35% ALU instructions, 10% branches, and 5% jump. Which implementation is faster and by how much? An implementation in which every instruction operates in 1 clock cycle of a fixed length or of a variable length. 5
- Describe the execution steps of the following instruction both in single cycle and multi-cycle data path. `sw $t0, 32($t1)` 6
- What are the benefits of multi-cycle over single cycle data path due to structural changes? Explain with example. 4

Group-B

- Draw a pipeline version of the data path and describe how a load instruction executes through it. 5
- What are the reasons behind pipeline hazards? Does there any hazard exist in the following code segment? If yes, name the type of hazard and rewrite the code to resolve them. 5
- ```
lw $t6, 0($t0)
lw $t7, 4($t0)
add $t3, $t6, $t7
sw $t3, 12($t0)
lw $t4, 8($t0)
add $t5, $t6, $t4
sw $t5, 16($t0)
```
- What is miss penalty? How to handle cache misses? 2
- What do you mean by principles of locality? Discuss different types of locality. 3
- Define virtual memory and page fault. 3
- What is cache memory? Define types of cache memory with figure. 2
- What are the effects of using or not using page table and TLB in the virtual memory organization, describe with the figure. 5
- Define RAID. How could it be helpful? List out and describe at least two types of RAID. 5
- Write short notes on memory hierarchy. 2
- What is I/O channel? What is the architecture of I/O channel? 3
- How can we obtain physical address using virtual page number? 2
- What are the two solutions used for data hazard? Discuss with proper figure. 3