

## **CSE 2213: COMPUTER ARCHITECTURE**

### **Question pattern:**

1. Chapter 1+ Chapter 2
2. Arithmetic (Chapter 3: Patterson)
3. Chapter 4+ Chapter 7
4. Chapter 4+ Chapter 7
5. Chapter 5
6. Chapter 8
7. MIXED (From all chapters except arithmetic)

### **QUESTION LIST**

#### ***CHAPTER 1: BASIC STRUCTURE OF COMPUTERS***

1. What is computer architecture?
2. What are the tasks of a computer architect?
3. What are the two different views of computer architecture?
4. Briefly explain Instruction Set Architecture and Computer Organization.
5. What is a computer? What are the basic functions performed by a computer?
6. Describe the basic functional units of a computer (with diagram).
7. Define the following terms:

Data, Instructions, Program, MAR, Memory word, Word length, Program counter(PC), Memory access time, IR, Memory address, MDR, Registers, Timing signals, Clock cycle, Instruction throughput, Clock rate, Bus, Data bus, Address bus, Control bus.

8. Write short notes on memory unit/Control unit of a computer.
9. Explain the two classes of storage with examples.
10. Write in brief the basic operating steps to execute a program.
11. What is BUS? What are the advantages and disadvantages of single bus architecture? Draw the basic block diagram of the single bus architecture.
12. Write down the procedure of interrupt operation. [Slide#35]
13. What are the four classes of interrupt? [Slide#36]
14. What is system software? What are the functions of system software?
15. What is operating system? What are the tasks of OS routines?
16. What do you understand by CISC and RISC architecture? How they affect the N and S components of the basic performance equation? Which one is better and why?
17. Write down the basic performance equation. Explain each of the terms: T,N,S,R.  
  
Explain how you can improve the overall performance by improving each of these components.
18. What is SPEC rating? What is its purpose? How the SPEC rating is calculated?
19. Briefly explain the three factors that affect the performance of a computer.
20. How can we improve the performance of a computer?
21. Simple Mathematical problems with T, N, S, R, Ps.
22. What do you understand by Multiprocessors and Multi-computer systems?

## ***CHAPTER 2: MACHINE INSTRUCTIONS AND PROGRAMS***

1. What are the three different ways to represent signed integer numbers in a computer system? Explain each one with an example.
2. What do you understand by overflow? Explain with example.
3. What do you understand by “big-endian” and “little-endian” assignments of memory addresses?
4. What do you understand by condition codes? Give examples. What is condition code register or status register? How Condition Codes or Status Flags Set/Reset? Explain with an example .
5. Briefly describe four types of CPU organization.
6. Write necessary machine instructions to evaluate any given expression using the following instruction formats:
  - a) Three address Instruction Format
  - b) Two address Instruction Format
  - c) One address Instruction Format
  - d) Zero address Instruction Format
  - e) RISC Instruction format
7. What do you understand by straight line sequencing and branching?
8. What do you understand by byte addressable memory and word alignment? Explain.
9. What is addressing mode? Explain each of the following addressing modes with examples: Immediate, Register, Absolute/Direct, Indirect, Index, Base with index, Base with index and offset, Relative, Auto increment, Auto decrement.

10. Identify the addressing modes of each operand of the given instructions.
11. Sample assembly language notation programs based on fig 2.12, 2.15, 2.16.

### ***CHAPTER 3: ARITHMETIC FOR COMPUTERS( Patterson)***

1. Design a sequential multiplier circuit for unsigned numbers. Explain its various components and operations.
2. Draw the flowchart of Sequential Multiplication Algorithm for unsigned numbers.
3. Using an Example, explain the Sequential Multiplication Algorithm for unsigned numbers/ multiply two given numbers using the Sequential Multiplication Algorithm.
4. Design a sequential circuit for division of two integer numbers. Explain its various components and operations.
5. Draw the flowchart of Sequential division Algorithm for unsigned numbers.
6. Using an Example, explain the Sequential division Algorithm for unsigned numbers/ divide two given numbers using the Sequential division Algorithm.

### ***CHAPTER 4: INPUT/OUTPUT ORGANIZATION***

1. Briefly explain how an I/O device is accessed by the CPU using the single bus architecture? Show the different components of an I/O interface circuit and explain their role during an I/O transfer operation. Also, name the three different paradigms (of techniques) to access I/O devices.
2. What are the three different paradigms (of techniques) to access I/O devices? What are their relative advantages and disadvantages? Explain in brief.
3. What do you understand by Interrupt, Interrupt Service Routine (ISR),

Interrupt Latency, and Interrupt Acknowledgement, polling, vectored interrupt ?

4. What is the role of IE (Interrupt Enable) and ID (Interrupt Disable)

instructions? How they are used by ISR? What is the role of the IE bit inside the I/O device interface and inside the CPU?

5. In a system with a single interrupt request line, how the CPU can identify which device has generated an interrupt?

6. Explain the priority structured, polling, Daisy Chain and Priority Daisy Chain Schemes to handle simultaneous interrupt requests or

What are the different techniques to handle simultaneous interrupt requests?

Explain each one of them.

7. Write short notes on DMA/What is DMA? How it works? Explain the different registers in a DMA interface.

8. What do you understand by 'bus arbitration'? Describe the centralized Bus arbitration procedure.

9. Describe the distributed Bus arbitration procedure using an example.

10. What do you understand by 'bus' and 'bus protocol'?

11. What is Synchronous and Asynchronous Bus? What are their relative advantages and disadvantages?

12. What are the purposes of master ready and slave ready signals?

13. Describe the data transfer procedure using Handshake protocol in asynchronous bus.

14. What is double buffering?

15. Define: Strobe, Bit rate, bridge circuit.

16. Write short notes on PCI bus. Also, name and explain a few data transfer signals used for the PCI bus.
17. Write short notes on SCSI bus. Also, name and explain a few data transfer signals used for the SCSI.
18. Write short notes on Universal Serial Bus (USB) including the USB connection structure, the addressing protocol and packet format. Also, Show some sample USB transfer operations.

### ***CHAPTER 5: THE MEMORY SYSTEM***

1. Draw and briefly describe the internal organization of the memory chips with Memory Cells. What do you understand by memory access time, memory cycle time, random access memory, latency, and bandwidth?
2. What are the two different types of memory cells? Mention their relative advantages and disadvantages. Which one is better for Cache memory? Which one is more suitable for main memory (RAM)? Justify your answer.
3. Write short notes on SRAM, DRAM, PROM, EPROM, EEPROM, Flash memory, locality of reference, Cache memory, Read hit/miss, write hit/miss.
4. Draw the schematic diagrams of the memory hierarchy and briefly explain the different levels of the memory hierarchy.
5. What do you understand by locality of reference? State the two principles of locality of reference.
6. Define the following terms:

Block, Hit, Miss, Hit rate, Miss rate, Hit time, Miss penalty, Write through protocol, dirty bit/modified bit, write back/copy back protocol, load through/early restart, mapping function, replacement algorithm, cache coherence problem .

7. What happens when read and write miss occur?

8. Explain the Direct mapped, Set Associative and Fully Associative Cache Architecture using examples. What are the advantages and disadvantages of direct mapping, associative mapping and set associative mapping?

9. Briefly describe the LRU replacement algorithm.

### ***CHAPTER 7: BASIC PROCESSING UNIT***

1. Draw the basic single bus organization of the data path inside a processor, label its various components and briefly explain their functions.

2. Show the input and output gating signals of the various registers for the single bus processor data path. Also, show the connection and control signals for the MDR register.

3. Write down the control sequence for the fetch stage of any instruction for the single bus processor architecture. How does the control sequence differ for the three bus data path architecture?

4. Identify the differences between single-bus and three-bus architecture.

5. Write down the control sequence for the fetch and execution stages of any given instruction, assuming single bus architecture of the processor data path.

6. Design a simple three bus architecture for the CPU Data path, Label its various components. Also, write down the control sequence of the given

instructions for this three-bus CPU data path architecture.

7. What are the two different design paradigms for the CPU control unit? What are their relative advantages and disadvantages?

Or, Describe the two different design paradigms for the CPU control unit.

8. Draw the basic block diagram of a hardwired processor control unit.

Label/Name its essential components.

9. What do you understand by control word, control store/ROM,

Microinstruction, micro program counter and micro-routine?

10. Draw the block diagram of a micro-programmed CPU control unit. Show the micro-routines corresponding to the given instructions.

11. Briefly explain the fetch and execution cycles for executing an instruction.

## ***CHAPTER 8: PIPELINING***

1. What is pipelining? How pipeline works?

2. “Pipeline increases the throughput of the system, but the latency of each instruction is still remained unchanged” – Do you agree? Explain with an example.

3. What is the role of the cache memory in pipelining?

4. Write down the advantages and disadvantages of pipelining.

5. Basic hardwire organization for a 2-stage and a 4-stage pipeline with brief description.

6. What is Hazard? Explain the three different types of Hazard with necessary examples.

7. Give an example of Data Hazard. How Data Hazard is handled in hardware and software?



8. Explain the Operand forwarding technique with an example.
9. Describe Superscalar operation.