



Chapters 5 & 6 Study Points

Chapter 5

- Define factors affecting decisions in designing instruction set architectures (ISA's).
- Discuss the concept of 'endianness' – define both big & little endian.
- I give an example of a WORD number, you show in both big & little endian format.
- Define the three architecture designs – stack, accumulator, general purpose register.
- Define both infix & postfix notation.
- With which architecture/s is postfix notation used? With which is infix used?
- I give an infix expression; you show it in postfix format.
- If an ISA has 100 different instructions, how many bits would be necessary for the opcode? (I may give you a different number on the exam).
- Addressing: the actual location (byte number) of an operand is known as_____.
- Know how to define following addressing modes: immediate; direct; register; indirect; register indirect; indexed; based; stack.
- Fill in the following table (for the LOAD instruction shown) as we did in class (will have different values):

Memory		R1		LOAD 800	
800	900		800		
...					
900	1000				
...					
1000	500				
...					
1100	600				
...					
1600	700				

Mode	Value Loaded into AC
Immediate	
Direct	
Indirect	
Indexed	

- Discuss the concept of pipelining.
- You are provided the following info: the number of stages in the pipeline; the time needed for each stage; and the number of tasks to be executed. Apply the formula

$$\text{Speedup } S = \frac{nt_n}{(k + n - 1) t_p} \quad (\text{see slide 36 for example})$$

- Discuss several things that can compromise the speedup pipelines are supposed to provide.



- Regarding Java: the java compiler creates 'byte code', which are instructions that are created to be understood by the JVM (java virtual machine), which converts byte code into operating system specific commands.
- Java was defined for performance?

Chapter 6

- Discuss the differences between DRAM & SRAM.
- List the order of memory hierarchy, starting from fastest (do not include registers) to slowest (six levels).
- Know the definitions of the following: hit; miss; hit rate; miss rate; hit time; miss penalty.
- Define principle of locality – and the three types.
- Define the three types of cache we discussed in class, and the differences between them.
- For 'direct mapped' cache, show the formula which is used to determine which blocks of memory are mapped to which blocks of cache. Show an example using this formula (see slides 13 – 20. Be especially familiar with slides 17-19, which discuss how a RAM memory address is partitioned into 'tag, block, word' based upon the size of the cache.
- Discuss the main disadvantage of using 'direct mapped' cache.
- Be familiar with what the 'valid bit' is about.
- Know specifics of 'fully associative' cache, and how the memory address is partitioned. Same for 'set associative' cache.
- Be able to define and differentiate among the various 'replacement policies'.
- Know how to apply the formula 'effective access time (EAT). If I give you a number for main memory access time, supported by a cache with a given access time and a given cache hit rate, plug these numbers into the formula to determine the EAT. See slides 32-33.
- Define 'dirty blocks', and 'write policies'.
- What is 'Harvard' cache? 'Unified' or 'integrated' cache? 'Victim' cache?
- Define 'inclusive', 'strictly inclusive', and 'exclusive' caches.
- What is the purpose of 'virtual' memory? What advantage does it offer?
- A physical address is _____.
- A page fault occurs when _____.
- Memory fragmentation occurs when _____.
- A 'page table' is used to _____.
- I provide a virtual address, a 'page table', and information regarding the size of the system's: a) virtual address space, b) physical address space. c) page size. You then show how this virtual address is converted to a physical address (see slides 47-50 for an example of this exercise).
- Use formula to figure out EAT when using virtual memory – see slide 51.
- What is a 'translation look-aside buffer', and what advantage does it offer?
- Another approach to virtual memory is 'segmentation'. How is it different than 'paging'? Advantages/disadvantages of each?