

BÀI TẬP KIẾN TRÚC MÁY TÍNH – PHẦN HIỆU SUẤT

1. What is a stored program computer?
2. What are the four main components of any general-purpose computer?
3. At the integrated circuit level, what are the three principal constituents of a computer system?
4. Explain Moore's law.
5. List and explain the key characteristics of a computer family.
6. What is the key distinguishing feature of a microprocessor?
7. On the IAS, describe in English the process that the CPU must undertake to read a value from memory and to write a value to memory in terms of what is put into the MAR, MBR, address bus, data bus, and control bus.
8. A benchmark program is run on a 40 MHz processor. The executed program consists of 100,000 instruction executions, with the following instruction mix and clock cycle count:

Instruction Type	Instruction Count	Cycles per Instruction
Integer arithmetic	45000	1
Data transfer	32000	2
Floating point	15000	2
Control transfer	8000	2

Determine the effective CPI, MIPS rate, and execution time for this program.

9. Consider two different machines, with two different instruction sets, both of which have a clock rate of 200 MHz. The following measurements are recorded on the two machines running a given set of benchmark programs:

Instruction Type	Instruction Count (millions)	Cycles per Instruction
Machine A		
Arithmetic and logic	8	1
Load and store	4	3
Branch	2	4
Others	4	3
Machine B		
Arithmetic and logic	10	1
Load and store	8	2
Branch	2	4
Others	4	3

- a. Determine the effective CPI, MIPS rate, and execution time for each machine.
- b. Comment on the results.

10. Early examples of CISC and RISC design are the VAX 11/780 and the IBM RS/6000, respectively. Using a typical benchmark program, the following machine characteristics result:

Processor	Clock Frequency	Performance	CPU Time
VAX 11/780	5 MHz	1 MIPS	12 <i>x</i> seconds
IBM RS/6000	25 MHz	18 MIPS	<i>x</i> seconds

The final column shows that the VAX required 12 times longer than the IBM measured in CPU time

- What is the relative size of the instruction count of the machine code for this benchmark program running on the two machines?
 - What are the **CPI** values for the two machines?
11. Four benchmark programs are executed on three computers with the following results:

	Computer A	Computer B	Computer C
Program 1	1	10	20
Program 2	1000	100	20
Program 3	500	1000	50
Program 4	100	800	100

The table shows the execution time in seconds, with 100,000,000 instructions executed in each of the four programs. Calculate the MIPS values for each computer for each program. Then calculate the arithmetic and harmonic means assuming equal weights for the four programs, and rank the computers based on arithmetic mean and harmonic mean.

12. The following table, based on data reported in the literature [HEAT84], shows the execution times, in seconds, for five different benchmark programs on three machines

Benchmark	Processor		
	R	M	Z
E	417	244	134
F	83	70	70
H	66	153	135
I	39,449	35,527	66,000
K	772	368	369