

MICROPROCESSOR TUTORIAL

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PART 1: BASIC DIGITAL THEORY

1. What is meant by the term 'digital systems' ?
2. What kind of number system used in digital systems ?
3. Define the terms :- bit, nibble, byte, word. Give an example of each.
4. List several advantages of digital over analog circuits.
5. List ten devices that uses or contain digital circuitry.
6. If the digital circuits in a computer only respond to binary numbers, why are octal and hexadecimal numbers used extensively by computer specialists ?
7. Convert the following numbers into 8 bits binary number.
a) 32 b) 78 c) 100 d) 150 e) 200 f) 255
8. Convert the following binary numbers into decimal and hexadecimal numbers.
a) 10101010 b) 11001100 c) 11011001
9. Convert the following hexadecimal numbers into binary number.
a) 32H b) A78H c) 1C9H d) 05F0H e) 2B50H f) FFFFH
10. Add the following binary numbers together.
a) 10010011 and 01101111 b) 11000111 and 10001101
11. Subtract the following binary numbers.
a) 00010011 from 01101111 b) 11000111 from 10001101
c) 10111001 from 00111001

PART 2: BASIC MICROCOMPUTER SYSTEM

12. What is a microprocessor ?
13. What corporation produce the first microprocessor chip and what is the chip used for ?
14. What is a microcomputer system ? Draw a block diagram of a microcomputer system.
15. Why is the microcomputer system is used in many dedicated electronic devices (such as microwave oven control panels, electronic games) instead of the digital integrated circuits ?
16. What are the uses of the memory unit in a microcomputer system ?
17. Explain briefly what are the ROM and RAM memory chips. Draw the block diagram of each and explain the lines on the chips.
18. Below are memory chip has a specifications. For each type, determine the total number of addresses, its range and total number of data bytes it can store.
 - a) (2K x 8) ROM
 - b) (4K x 8) ROM
 - c) (2K x 8) RAM
 - d) (16K x 8) ROM
 - e) (32K x 8) ROM
 - f) (1K x 8) RAM
19. Briefly explain the functions of the input / output unit in a microcomputer system.
20. What kind of signals that is sent out or received by the I/O unit ?
21. What is system bus ?
22. Explain the address, data and control bus functions. How many lines are these busses ?
23. State the lowest address and the highest address that a 16 bit address bus can address in hex.

24. What is the role of the microprocessor clock ? Does a higher clock speed give an advantage ?

PART 3: BASIC MICROPROCESSOR ARCHITECTURE

25. Draw a simplified block diagram of the internal architecture of a microprocessor chip. What are the functions of each of the blocks ?
26. List all the general purpose registers. What are their sizes and what are they used for ?
27. Why is the accumulator a special register ?
28. What is the use of the flag register ? Can the contents of flag register be used by the programmer ?
29. A register pair can be used to hold a memory address. What other registers can hold memory address ?
30. What are the differences between a register pair compared to an index register ?
31. What is a fetch cycle ?
32. What is a decode cycle ?
33. What is an execute cycle ?
34. Briefly explain what happens after an instruction is loaded into the microprocessor Instruction's Register (IR) ?

PART 4: INSTRUCTION SET

35. Why is a microprocessor instruction a unique binary word ?
36. How does the microprocessor tell the difference between an instruction word and a data word of the same value ?

37. What is the microprocessor's instruction set ?
38. A microprocessor instruction can be broken into two parts. What are they, and what function does each part perform ?
39. Why do we use a mnemonic instead of the actual binary op-code ?
40. What kind of instructions do not address anything ?
41. What do we call the computer program used to convert mnemonics (assembly language) into machine readable code ?
42. Explain briefly the meaning of addressing mode. Give the addressing modes available for the microprocessor that you are using.
43. Which addressing modes put the instruction and address in a single word ?
44. Where is the data located in an instruction using immediate addressing ?
45. Where is the data located in an instruction using direct addressing ? Hence explain the difference between immediate and direct addressing.
46. Explain how register indirect addressing works. Why can it be a single word instruction ?
47. What is the difference between indexed and relative addressing ?
48. Explain what is a T-state. How can we determine the duration of one T-state ?
49. An instruction has 4 T-states. Calculate the execution time if the CPU has a clock of 1MHz.
50. There are times when it is necessary to write program very carefully in order to use the smallest amount of memory possible. What conditions would cause this to be necessary ?

THE END