Tutorial 01.

01)

Generation	Technology Used
1st Generation (1940-1950)	• Vacuum Tube Technology
2nd Generation (1950-1960)	• Transistors
3rd Generation (1960-1970)	• Integrated Circuits (IC)
4th Generation (1970-present)	• Large Scale Integrated Circuits (LSIC) • Very Large-Scale Integrated Circuits (VLSIC) • Microprocessor
5th Generation(present-future)	• Ultra Large Scale (ULSI) • Artificial Intelligence Technology (AI)

02) Computer Architecture – In computer manufacturing concepts, engineering mechanisms and design principles setting up the frame work to build dynamically changing computer architecture.
Computer architecture is the organization of the components which make up a computer system and the meaning of the operations which guide its function.

03) Computer Organization
Instruction Set Architecture (ISA)
Microarchitecture

Tutorial 02.

01) F = A`B + AB`

Answer = XOR Gate

A	B	Output
0	0	0
0	1	1
1	0	1
1	1	0

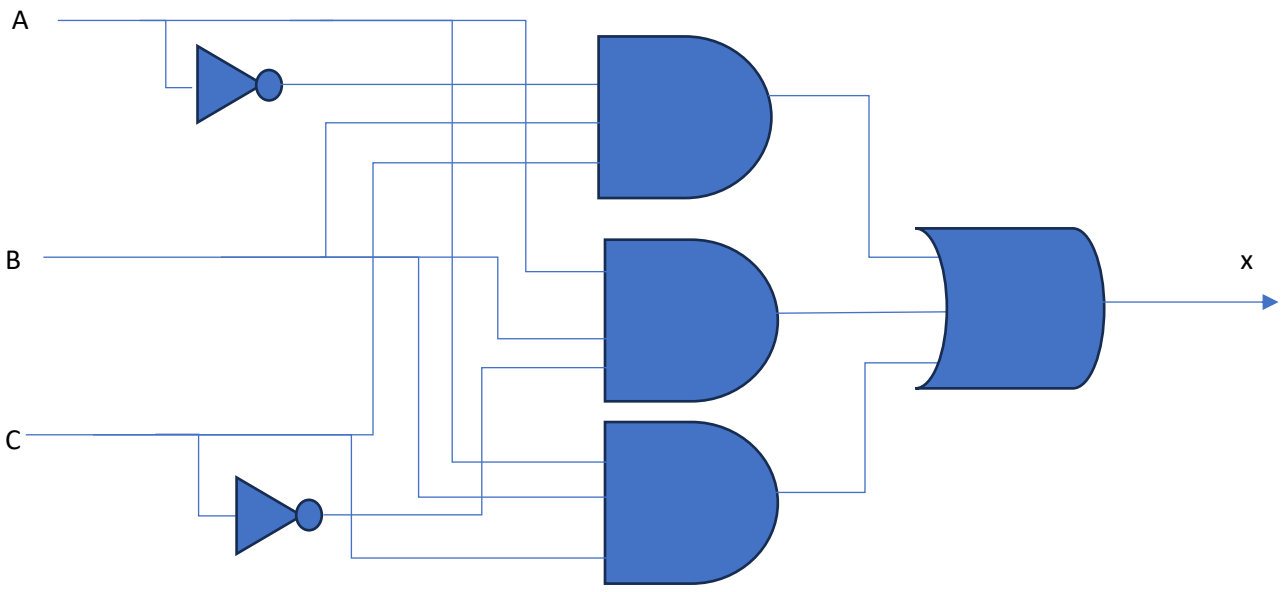
02)

A	B	C	B`	C`	AB`C`	ABC`	ABC	F = AB`C`+ABC`+ABC
0	0	0	1	1	0	0	0	0
0	0	1	1	0	0	0	0	0
0	1	0	0	1	0	0	0	0
0	1	1	0	0	0	0	0	0
1	0	0	1	1	1	0	0	1
1	0	1	1	0	0	0	0	0
1	1	0	0	1	0	1	0	1
1	1	1	0	0	0	0	1	1

03)

Carbon dioxide (A)	Temperature (B)	Water pressure (C)	Output (X)
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1

$X_{(A, B, C)} = A`BC + ABC` + ABC$



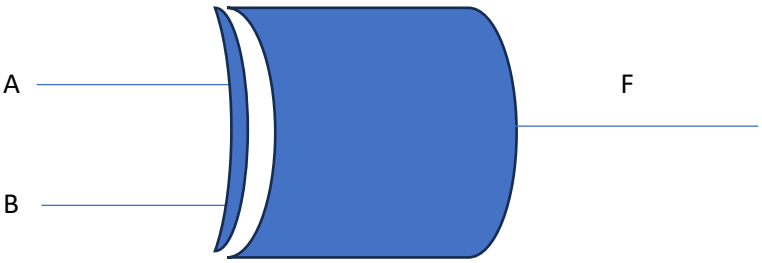
Tutorial 03.

01)

A)

A	B	Output (F)
0	0	0
0	1	1
1	0	1
1	1	0

B)



02)

Y = AB + CD

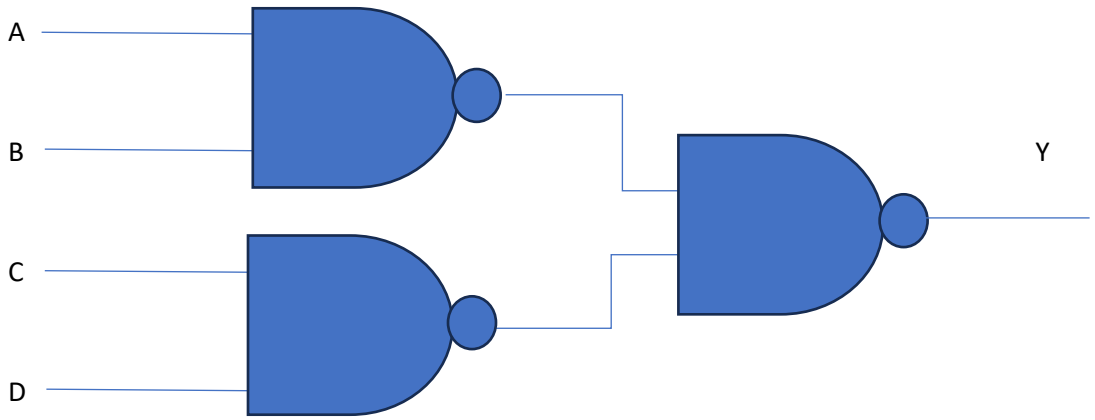
A) Y = AB . CD

Y = AB . CD

Y = AB + CD

Y = AB + CD

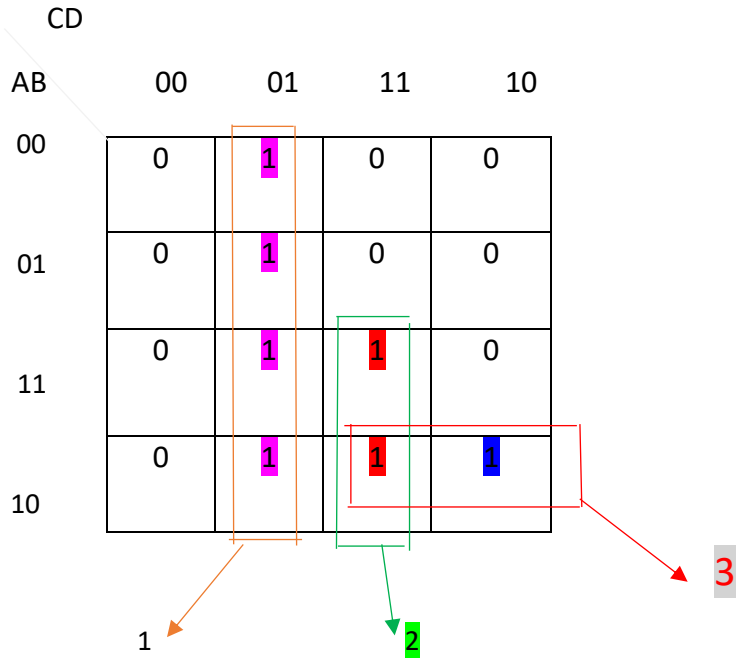
B)



03) X = A (+) B . B (+) C . C

Tutorial 04.

01)



1	2	3
A` B` C` D	A B C D	A B` C D
A` B C` D	A B` C D	A B` C D`
A B C` D		
A B` C` D		
C`D	ACD	AB`C

Out (F) = C`D + ACD + AB`C

02) Minimize the given Boolean Expression by using the four – variable K – Map.

$F_{(A, B, C, D)} = \sum m\,(1,5,6,12,13,14) + d\,(2,4)$

Tutorial 05.

01) R = 10 Ω
I = 2 A
V =?

V= I R
V = 2*10
V= 20V

02) V = 12V
R = 4 Ω
I =?

V = I R
12 = I*4
I = 3 A

03) R = 50 Ω
V = 120 V
I =?

V = I R
120 = I * 50
I = 2.4 A

04) I = 5 A
V = 20 V
R =?

V = I R
20 = 5 * R
R = 4 Ω

05) P = 12W
I = 2A
R =?

$P = V I$
$P = V^2 / R$
$P = I^2 R$

$P = I^2 R$
$12 = 2*2*R$
R = 3 Ω

06) R = 8 Ω
I = 3 A
P =?

$P = I^2 R$
P = 3*3*8
P = 72 W

07) I = 2A
R = 15 Ω
P =?

$P = I^2 R$
P = 2*2*15
P = 60 W

08) P = 60W
V = 120V
I =?

P = VI
60 = 120*I
I = 0.5 A

09) V = 24 V
P = 48 W
I =?

P = VI
48 = 24 * I
I = 2 A

10) R = 100 Ω
P = 2 W
I =?

$P = I^2 R$
2 = I*I*100
$I^2 = 0.02$
I = √0.02 A
I = 0.1414 A

Tutorial 06.

01)

i) $R_1 = 6\Omega$
$R_2 = 12\Omega$
$I = 1\ A$
$R = ?$
$V = ?$

$R_T = R_1 + R_2$
$R_T = 6 + 12$
$R_T = 18\ \Omega$

$V = I\ R$
$V = 1 * 18$
$V = 18\ V$

ii) $1/R_T = 1/R_1 + 1/R_2$
$1/R_T = 1/6 + 1/12$
$1/R_T = 2/12 + 1/12$
$1/R_T = 3/12$
$1/R_T = 1/4$
$R_T = 4\ \Omega$

$V = IR$
$V = 1 * 4$
$V = 4\ V$

02)

i) $R_T = R_1 + R_2 + R_3$
$R_T = 6 + 12 + 4$
$R_T = 22\ \Omega$

ii) $I = ?$
$V = I\ R$
$12 = I * 22$
$I = 12/22$
$I = 0.5454\ A$
$I = 0.55\ A$

Tutorial 07.

01)

$I_T = I_1 + I_2 + I_3$

$V_T = V_1 + V_2 + V_3$

1. $R_1 = 4\ \Omega$
   $R_2 = 12\ \Omega$
   $R_3 = 6\ \Omega$
   $V = 12\ V$

   i) $1/R_T = 1/R_1 + 1/R_2 + 1/R_3$
   $1/R_T = 1/4 + 1/12 + 1/6$
   $1/R_T = 3/12 + 1/12 + 2/12$
   $1/R_T = 6/12$
   $R_T = 2\ \Omega$

   ii) $I_T = I_1 + I_2 + I_3$

   $V = I\ R_T$
   $12 = I * 2$
   $I = 6\ A$

   iii) $V = I\ R$
   $12 = I * 6$
   $I = 2\ A$

   iv) $V = I\ R$
   $12 = I * 12$
   $I = 1\ A$

   v) $V = I\ R$
   $12 = I * 4$
   $I = 3\ A$

02) $R_1 = 6\ \Omega$

$R_2 = 6\ \Omega$

$R_3 = 3\Omega$

$V = 12\ V$

i) $1/R_T = 1/R_1 + 1/R_2$

$1/R_T = 1/6 + 1/3$

$1/R_T = 1/6 + 2/6$

$1/R_T = 3/6$

$R_T = 2\ \Omega$

ii) $R_T = R_1 + R_2$

$R_T = 6 + 2$

$R_T = 8\ \Omega$

iii) $V = I\ R$

$12 = I * 8$

$I = 12/8$

$I = 1.5\ A$

iv) $V = I\ R$

$V = 1.5 * 6$

$V = 9\ V$

v) $V = I\ R$

$V = 1.5 * 2$

$V = 3\ V$

vi) $V = I\ R$

$3 = I * 6$

$I = 3/6$

$I = 0.5\ A$

vii) $V = I\ R$

$3 = I * 3$

$I = 1\ A$

viii) $R_T = R_1 + R_2$

$R_T = 6 + 6$

$R_T = 12\ \Omega$

$V = I\ R$

$12 = I * 12$

$I = 1\ A$

Tutorial 08.

01)

- OPCODE = 9 Bits
- MEMORY ADDRESS = 25 Bits

a) What is the size of its instruction?

= (9 + 25) Bits

= 34 Bits

b) How many different instructions can it have?

= 2^n

= 2^9

= 512 Instructions

c) What is the maximum memory size that it can address? (Hint: Assume that 2^20 is about 1M).

= 2^n

= 2^{25}

= $2^5 * 2^{20}$

= $2^5 * 1M$

= 32 * 1M

= 32M

02) Given a CPU with a 8 bits word, 8 registers, and instructions that are exactly 1 word long and which has 2 operands:

a) How long can the opcode field be in an instruction?

= 2^n

= 2^4

= 16 Instructions

b) How many instructions can the CPU support?

= 2^n

= 2^8

= 256 Instructions

Tutorial 09.

01) What is meant by an instruction?
    - A computer instruction is an order given to a computer processor by a computer program. At the lowest level, each instruction is a sequence of 0's and 1's that describes a physical operation the computer is to perform.

02) Instruction Set Architecture (ISA), is the part of the computer architecture related to?
    - An instruction set Architecture (ISA) is part of the abstract model of a computer that defines how the CPU is controlled by the software. The ISA acts as an interface between the hardware and the software, specifying both what the processor is capable of doing as well as how it gets done.

03) Instruction format contains of two main parts. What are they?
    - Opcode
    - Operand

04) Where are instructions stored?
    - Computer Memory

05) How are instruction stored?
    - Instructions are stored in computer memory in a binary format. The binary format represents each instruction as a sequence of binary digits (0's and 1's). This binary representation is known as machine code, which is directly understandable by the computer's hardware.

06) An instruction differs from another instruction by 3 main factors? What are they?
    - Opcode
    - Operands
    - Addressing Mode

07) A computer that is used for simple numerical problems, uses 6 bits for an opcode, and 12 bits for a memory address. What is the size of its instruction?

    Opcode = 6 Bits
    Memory Address = 12 Bits

    = (6 + 12) Bits
    = 18 Bits

08) A computer that is used for simple numerical problems, uses 6 bits for an opcode, and 12 bits for a memory address. How many different instructions can it have?

Opcode = 6 Bits
Memory Address = 12 Bits

$= 2^n$
$= 2^6$
= 64 Instructions

09) A computer that is used for simple numerical problems, uses 9 bits for an opcode, and 25 bits for a memory address. What is the maximum memory size that it can address? (Hint: Assume that 2^20 is about 1M).

$= 2^n$

$=2^{25}$

$=2^5 * 2^{20}$

=32 * 1M

=32M

10) Memory address of the instruction format contains of two parts. What are they?

- Opcode
- Operands

*********Tutorial 4) 2