III-Sem (BEC302 - DIGITAL SYSTEM DESIGN)

AKTU : Syllabus

Unit-I

Logic simplification and combinational logic design: Number Systems, Binary arithmetic, signed magnitude representation, Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, tabulation method.

Unit-II

Combinational circuits: Analysis and Design of combinational circuits, MSI devices like comparators, multiplexers, demultiplexers, encoder, decoder, circuit realization using Multiplexers and decoders, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU.

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Unit-III

Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF, edge triggered FF, Flip flop conversion, Applications of Flip Flops: ripple and synchronous counters, Ring counter, Johnson counter, shift registers: SISO, SIPO, PISO, PIPO, Bidirectional shift register, Universal shift register; Finite state machines: Mealy and Moore machines, State diagrams, state reduction, Analysis of clocked sequential circuits, Design of clocked sequential circuits

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Unit-IV

Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.

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Unit-V

Digital-to-Analog converters (DAC): Specifications of DACs, Weighted resistor, R□2R ladder, Analog-to-digital converters (ADC): Specifications of ADCs, principle of ADC, switched capacitor circuits: Basic concept, practical configurations, ADC etc. ADC Types: dual slope, successive approximation, counting type, flash etc.

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All Subjects

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Thank You

DIGITAL SYSTEM DESIGN

UNIT 1 : LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

AKTU Syllabus

Logic simplification and combinational logic design: Number Systems, Binary arithmetic, signed magnitude representation, Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, tabulation method.

DIGITAL SYSTEM DESIGN

UNIT 1 : LOGIC SIMPLIFICATION AND COMBINATIONAL LOGIC DESIGN

Today's Target

- NUMBER SYSTEM ✓
- ITS TRANSFORMATION ✓
- DPP ✓

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Digital Systems are useful in:

- Communication
- Business Transaction
- Traffic Control
- Spacecraft Guidance
- Medical Treatment etc

Advantage of Digital System

- Generality
- Flexible
- Can perform variety of task
- Range over wide spectrum of applications
- Ability to represent and manipulate discrete elements of information.

WHAT ARE DIGITAL SYSTEMS?

- Any system which takes digital inputs – process this data – gives digital outputs are digital systems.
- Signals represented in the form of 1's and 0's are called as digital signals.
- This is a form of encoding of signals.
- Group of bits = binary codes

Number Systems:

- ✓ Decimal (Base: 10)
  - Symbols: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- ✓ Binary (Base 2)
  - Symbols: 0, 1

- ✓ Octal (Base 8)
  - Symbols: 0, 1, 2, 3, 4, 5, 6, 7
- ✓ Hexadecimal (Base 16)
  - Symbols: 0, 1, 2, ... — 9, A, B, C, D, E, F
- ✓ Excess-3 →
- ✓ Gray ✓
- ✓ BCD ✓

Binary Number System:

- Uses two symbols 0, 1
- Base or radix = 2
- 1 nibble = 4 bits
- 1 byte = 8 bits
- 1Kbits (kilo) = 2^{10} = 1024 bits
- 1Mbits (mega) = 2^{20} = 1024 x 1024 bits
- 1Gbits (giga) = 2^{30} = 1024 x 1024 x 1024 bits
- 1 Tbits (tera) = 2^{40}

0/1 = Bit

0110

10100100

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➢Numeric systems :

> we use daily is the decimal system,

> this system is not convenient for machines

> the information is handled codified in the shape of on or off bits

> necessity of knowing the positional calculation

> allow us to express a number in any base where we need it.

Radix number systems :

➢base of a number system or radix

➢ defines the range of values that a digit may have.

Conversion: Decimal To Binary

- **Successive division by 2:**

$(68)_{10} = (\quad)_2 = (1000100)_2$

2	68	0
2	34	0
2	17	1
2	8	0
2	4	0
2	2	0
2	1	0
	0,	1

↑

Example 2 : Decimal Number Conversion

$(0.683)_{10} = (0.1010\ldots)_2$

$0.683 \times 2 = 1.366$ → 1

$0.366 \times 2 = 0.732$ → 0

$0.732 \times 2 = 1.464$ → 1

$0.464 \times 2 = 0.928$ → 0

$(62.34)_{10} = (111110.0101)_2$

2	62	0
2	31	1
2	15	1
2	7	1
2	3	1
2	1	1
	0	

$0.34 \times 2 = 0.68$ — 0

$0.68 \times 2 = 1.36$ — 1

$0.36 \times 2 = 0.72$ — 0

$0.72 \times 2 = 1.44$ — 1

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HOME WORK

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1) Convert $(2532)_{10}$ to binary

2) Convert $(0.528)_{10}$ to binary

3) Convert $((1685.29)_{10}$ to binary

4) Convert $(1546)_{10}$ to $(\text{-- })_2$

5) Convert$(0.445)_{10}$ to $(\text{-- })_2$

6) Convert$(1.5629)_{10}$ to $(\text{-- })_2$

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