**SAMSKRUTI COLLEGE OF ENGG & TECHNOLOGY**

**Approved By Aicte & Affiliated To Jawaharlal Nehru Technological University Hyderabad**

**Kondapur (V),Ghatkesar(M),Ranga Reddy District Hyderabad-501301**

**Department Of Computer Science Engineering**

**II Year/I Semester/(Digital Logic Design)**

**Name Of The Faculty: M. PAVANI Designation:Asst&Professor**

**Course Code: CS304ES Subject Title:Digital Logic Design**

**Year/Sem:II/I Class:B.Tech**

**UNIT I**

**DIGITAL SYSTEMS**

**Syllabus:**Digital Systems: Binary Numbers, Octal Numbers, Hexadecimal And Other Base Numbers, Number Base Conversions, Complements ,Signed Binary Numbers, Floating Point Number Representation, Binary Codes, Error Detecting And Correcting Codes, Digital Logic Gates(And,Nand,Or,Nor,Ex-Or,Ex-Nor),Boolean Algebra, Basic Theorems And Properties, Boolean Functions,Canonical And Standard Forms.

**Objectives:**

* To Understand Basics Of Number Systems Codes And Logic Gates.
* To Understand Boolean Algebra And Minimization Logic.
* To Understand The Design Of Combinational Sequential Circuits.
* To Understand The Basic Of Various Memory.

**Lecture Plan**

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| --- | --- | --- |
| **S.No** | **Topics To Be Covered 16** | **No.Of.Lectures** |
| 1 | Introduction To Digital Systems, Binary Numbers | 2 |
| 2 | Number Conversions | 2 |
| 3 | Complements. Signed Binary Numbers | 2 |
| 4 | Floating Point Number Representation | 2 |
| 5 | Binary Codes | 2 |
| 6 | Error Correcting & Detecting Codes | 1 |
| 7 | Digital Logic Gates | 1 |
| 8  | Boolean Algebra, Basic Theorems & Properties | 2 |
| 9 | Boolean Functions &Canonical & Standard Forms | 2 |

**Assignment Questions**

1.What Do You Mean By Digital Systems?Compare Digital & Analog?Advantags Of Digital Systems?

2.Write A Short Notes On?

A.Decimal B.Binary C.Octal D.Hexadecimal?

3.A.Convert Decimal (75)10 To Binary?

B.Convert (11110.1011)2 To Decimal?

C.Convert (2ac5.D)16 Binary And Then Octal?

4.What Is Mean By Complements?Explain A Bout 1’s Complement & 2’s Complement?

5.Explain Error Detection And Correction?

**Important Questions**

1.Write Short Notes On Binary Number Systems?

2.Discuss 1’s And 2’s Methods Of Subtraction?

3.Discuss Octal Number System?Hexadecimal Number System?

4.Explain About Logic Gates?

5.State And Prove De-Morgan Theorem?

6.Explain About Bcd Codes?What Are The Rules Of Bcd Addition?

7.Write The Axiomatic Definations Of Boolean Algebra?

8.Explain The 7-Bit Hamming Code?

9.Convert F(X)=X+Y’z Into Canonical Form?

10.State And Prove Idempotent Laws Of Boolean Algebra?

**UNIT-11**

**GATE LEVEL MINIMIZATION AND COMBINATIONAL CIRCUITS**

**Syallabus:**Gate Level Minimization And Combination Circuits,The K-Map Methods,3-Variable,4-Variable,5-Variable,Sum Of Products,Product Of Sums Simplification,Don’t Care Care Conditions,Nand & Nor Implementation And Other Two Level Implantation.

**Objectives**

* To Understand Basics Of Gate Level Minimization.
* To Understand K-Maps.
* To Understand The Sum Of Products.
* To Understand The Two Level Implantation.

**Lecture plan**

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| --- | --- | --- |
| **S.No** | **Topics To Be Covered 15** | **No Of Lectures** |
| 1 | Introduction To Gate Level Minimization & Combination Circuits | 2 |
| 2 | K-Map Methods,3-Variable,4-Variable,5-Variable | 3 |
| 3 | Sum Of Of Products | 2 |
| 4 | Product Of Sums Simplification | 2 |
| 5 | Don’t Care Conditions | 2 |
| 6 | Nand & Nor Implementation | 2 |
| 7 | Other Two Level Implantation. | 2 |

**Assignment Questions:**

1.Define K-Map?Name In Advantages And Disadvantages?

2.Explain Sop &Pos Forms Of K-Map For Three Variables?

3.Find The Implicants For The Following Functions & Determine Which Are Essential .F(W,X,Y,Z)=Ʃ(0,2,4,5,6,7,8,10,13,15)

4.Find The Reduced Sop Form Of The Following Function

F(A,B,C,D)=Ʃ(1,3,7,11,15)+Ʃd(0,2,4)

5.Simplify Following Logical Expression Using Karnaugh Maps?

Y=A’b’c’+A’b C’+A B’c’+A’b’c+Abc’

**Important Questions**

1.Summarize The Following Boolean Expressions Using K-Map And Implement Them Using Nor Gates?

A.F(A,B,C,D)=Ab’c’+Ac+A’cd’

B.F(W,X,Y,Z)=W’x’y’z’+Wxy’z’+W’x’yz+Wxyz

2.Design Bcd To Gray Code Converter And Realize Using Logic Gates?

3.What Are Don’t Care Conditions ?Explain Its Advantage With Example?

4.Simplify The Boolean Function

F(A,B,C,D,E)=Ʃm(0,2,4,6,9,11,13,15,17,21,25,27,29,31)

5.Minimize The Following Logic Function Using K-Map:

Y(A,B,C,D)=Ʃm(0,1,2,3,4,7,8,9,10,11,12,14) And Implement It Using Logic Gates?

6.Show Both Nand & Norgates Are Called Universal Gates?

**UNIT-111**

**COMBINATIONAL CIRCUITS**

**Combinational Circuits**:Design Procedure ,Combinational Circuit For Different Code Converters And Other Problems,Binary Adder,Subtractor,Multiplier,Magnitude Comparator,Decoders Encoders,Multiplexers,Demultiplexers.

**Objectives:**

* To Understand Combinational Circuits.
* To Understand Different Code Converters And Problems.
* To Understand Adders.Comparators.
* To Understand The Mux’s.

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| **S.No** | **Topics To Be Covered 17** | **No.Of .Lec** |
| 1 | Introduction To Combinational Circuits | 1 |
| 2 | Design Procedure | 2 |
| 3 | Combinational Circuit For Different Code Converters,Problems | 2 |
| 4 | Binary Adder | 2 |
| 5 | Subtractor | 2 |
| 6 | Multiplier | 2 |
| 7 | Magnitude Comparator | 2 |
| 8 | Decoders | 1 |
| 9 | Encoders | 1 |
| 10 | Multiplexers | 1 |
| 11 | Demultiplexers | 1 |

**Assignment Questions**

1.What Is Combinational Logic?Design A Combinational Logic Circuit That Produces The Product Of 2 Binary Number?A=(A 1a0)\*B=(B0 B1b 2)

2.Design Circuit To Detect Invalid Bcd Number And Implement Using Nand Gate Only?

3.Design 4-Bit Binary To Bcd Converter?

4.Explain The Design Procedure For Combinational Circuits?

5.Enlist Various Code Conversion Methods?

**Important Questions**

1.Solve The Following Boolean Function Using 4:1 Mux?

F(A,B,C,D)=Ʃm(1,3,5,7,8,9,0,2,10,12,13)

2. Design A Logic Circuit To Convert Bcd To Gray Code?

3.What Do You Mean By Half Adder And Full Adder?.Draw Half Adder Using Nand Gates?

4.Draw Half Subtractor Using Nand?

5.Design A 4-Bit Parallel Adder Using Full-Adders?4-Bit Subtractor?

6.Design A 4-Bit Carry Look-Ahead Adder Circuit?

7.Design 2-Bit Comparator Using Gates?

8.Define Encoder?Design Octal To Binary Encoder?

9.Differentiate Multiplexer And Demultiplexer?

10.Explain The Working Of 8:1multiplexer?

**UNIT IV**

**SYNCHRONOUS SEQUENTIAL CIRCUITS**

Synchronous Sequential Circuits:Latches,Flip-Flops,Analysis Of Clocked Sequential Circuits,Design Of Counters,Up-Down Counters,Ripple Counters,Registers,Shift Registers, Synchronous Conters.Asynchronous Sequential Sequential:Reduction Of State And Follow Tables,Role Of Free Conditions.

**Objectives**

* To Understand Synchronous Sequential Circuits.
* To Understand Latches,Flip-Flops.
* To Understand Counters,Shift Registers.
* To Understand Synchronous,Asynchronous.

**Lecture plan**

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| --- | --- | --- |
| **S.No** | **Topics To Be Covered 15** | **No.Of.Lectures** |
| 1 | Introduction To Synchronous Sequential Circuits | 1 |
| 2 | Latches | 2 |
| 3 | Flip-Flops | 2 |
| 4 | Analysis Of Clocked Sequential Circuits  | 2 |
| 5 | Design Of Counters,Up-Down Counters | 2 |
| 6 | Ripple Counters | 2 |
| 7 | Registers, | 2 |
| 8 | Synchronous Counters | 1 |
| 9 | Role Of Free Conditions | 1 |

**Assignment Questions**

1.Define Sequential Logic Circuit?What Is Flip-Flop?

2.Difference Between Combinational And Sequential Logic Circuits?

3.What Is Clock?State Its Use?

4.Explain A Bout Latches?

5.Differentiate Between Latches And Flip-Flops?

6.Explain T-Flip-Flop?

7.Explain Characteristic Equations Of Flip-Flops?

**Important Questions**

1.Explain About Binary Ripple Counter?What Is MOD Counter?

2.Design A 3-Bit Ring Counter?Discuss How Ring Counters Differ & Twisted Ring Counter?

3.Design Johnson Counter & State Its Advantages & Disadvantages?

4.Explain About RS & JK Flip-Flops?

5.Define Latch?Explain Different Types Of Latches In Detail?

6.Differentiate Critical And Non Critical Race Conditions?

7.Draw The JK Flip-Flop Using NAND Gates?

8.Give The Excitation Tables Of All Flip-Flops And Explain?

9.Convert The Following:

I)Jk To T Flip-Flop Ii)Rs To D Flip –Flop

10.Explain About The Analysis Of Clocked Sequential Circuits In Detail?

11.Design A Synchronous Sequential Circuit Using JK For The Given State Dig?

**UNIT-V**

**MEMORY**

**Syallabus**:Memory:Randam Access Memory,Types Of Rom,Memory Decoding,Address And Data Bus,Sequential Memory,Cache Memory,Programmable Logic Arrays,Memory Hierarchy In Terms Of Capacity And Access Time.

**Objectives:**

* To Understand Memory.
* To Understand Types Of Rom.
* To Understand Data Bus’s,Sequential Memory’s.
* To Understand The Pla,Access Time.

**Lecture plan**

|  |  |  |
| --- | --- | --- |
| S.No | Topics To Be Covered 10 | No Of Class |
| 1 | Introduction To Memory, Types Of Rom | 2 |
| 2 | Memory Decoding | 2 |
| 3 | Address And Data Bus | 1 |
| 4 | Sequential Memory | 1 |
| 5 | Cache Memory | 2 |
| 6 | Pla | 1 |
| 7 | Memory Hierarchy | 1 |

**Assignment Questions**

1.Explain Block Diagram Of Memory Unit?

2.Explain Detail About Ram And Types Of Ram?

3.Differentiate Static And Dynamic Ram?

4.Explain Pla With Help Of Block Diagram?

**Important Questions**

1.Construct A Logic Diagram Of Memory Cell?

2.Difference Between Sram & Dram And Static Ram Cell?

3.Design And Explain The Following Mapping Techniques Of Cache:

A)Direct Mapping

B)Associative Mapping

4.Sketch A Pla Circuit To Implement The Logic Functions

A’b C+Ab’c & A’b’c’+Bc

5.Explain About The Cache Replacement Algorithms?