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Lecture Plan-1

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - I

S. No.	Topic :- Introduction to digital electronics, digital signals	Time Allotted:-
1.	**Introduction** Digital electronics is the branch of electronics that deals with digital data and digital circuits. Digital signals are discrete in nature while analog signals are continuous in nature. Digital signals have only two states i.e. LOW and HIGH. Binary system is an example of digital system.	5 min
2	**Division of the Topic** -Introduction to digital electronics -Comparison between digital and analog system -Advantages of digital over analog system	35 min
3.	**Conclusion** Digital signals have great advantages over analog signals as simple operation, less noise and increased accuracy etc. Therefore digital systems are frequently used everywhere.	5 min
4	**Question / Answer** Q1 What is digital signal? A1 Digital signals are those signals which are discrete in nature. Q2 What is the difference between digital and analog signals? A2 Digital signals are discrete in nature while analog signals are continuous in nature	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-2

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - I

S. No.	Topic :- Logic Gates:- AND, OR, NOT, NOR, NAND, X-OR, X-NOR, Boolean algebra	Time Allotted:-
1.	**Introduction** Logic gates are the basic building blocks of digital circuits. Every gate perform some type of logical function like in AND gate the output is high only if all the inputs are high. Boolean algebra was developed by English mathematician George Boole. It consists of rules for the manipulation of binary variables.	5 min
2	**Division of the Topic** -Logic gates -Boolean algebra -Simplification using Boolean algebra	35 min
3.	**Conclusion** Digital gates like AND, OR and NOT are basic building blocks of digital electronics and NAND and NOR are universal gates. These are known as universal gates because these are sufficient for the realization of any logical expression.	5 min
4	**Question / Answer** Q1 Write the logical equation of AND logic gate? A1 Y=A.B Q2 What is equal to A.1? A2 A	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-3

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - I

S. No.	Topic :- Review of number system & conversion from one to another	Time Allotted:-
1.	**Introduction** Number system deals in the representation of various systems used for the representation of numbers. There are different types of systems used like Decimal, Binary etc. The number system with a base two is known as binary number system.	5 min
2	**Division of the Topic** -Binary number system -Octal number system -Hexadecimal number system -Conversion of one number system into another number system	35 min
3.	**Conclusion** The knowledge of number systems is very useful for understanding, analyzing and designing digital circuits.	5 min
4	**Question / Answer** Q1 Convert $(101)_2$ into decimal number A1 5 Q2 Tell the next number in octal :- $(777)_8$ A2 (1000)	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-4

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - I

S. No.	Topic :- Binary codes:- BCD, GRAY, EBCDIC, ASCII	Time Allotted:-
1.	**Introduction** The code refers to encryption system. There are different types of binary codes like BCD, ASCII etc. BCD refers to binary coded decimal. In this each digit is represented by four digit binary number. Gray code has a property that adjacent gray codes differ by only one digit. EBCDIC is Extended Binary Coded Decimal Interchange Code. This is an eight digit code. ASCII is American Standard Code for Information Interchange. This is a seven digit code.	5 min
2	**Division of the Topic** -BCD code -GRAY code -EBCDIC code -ASCII code	35 min
3.	**Conclusion** Computer and other digital circuits process data in binary format. Various binary codes are used to represent data. The interpretation of data is only possible if the code in which the information is available is known.	5 min
4	**Question / Answer** Q1 Write the BCD code of 5 A1 0101 Q2 ASCII code of A A2 1000001	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-5

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - I

S. No.	Topic :- Error detection and correction codes	Time Allotted:-
1.	**Introduction** These codes help us to trace out the errors in the digital data and to correct that error. There are many types of codes for error detection and correction e.g. parity bit is a kind of error detection code that can find only one bit error in the data. Hamming code is an error detection and correction code.	5 min
2	**Division of the Topic** -Parity bit -Odd parity -Even parity -Hamming code	35 min
3.	**Conclusion** These codes are used in detecting and correcting error in the transmitted digital data and it helps in the error free transmission of the data.	5 min
4	**Question / Answer** Q1 What are error detecting codes A1 These are the codes which help us in detecting the error Q2 Discuss any error detecting and correcting code A2 Hamming code	5 min

Assignment to be given:-
Q1 Write a short note on error detection and correction codes

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-6

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- Designing using logic gates	Time Allotted:-
1.	**Introduction** Various digital circuits can be designed by using the logic gates. Any logical expression can be realized by using basic gates. Universal gates are those gates which can design any kind of logical expression. Universal gates are NAND and NOR gates.	5 min
2	**Division of the Topic** -Designing using basic gates -Designing SOP form -Designing POS form	35 min
3.	**Conclusion** Various logical expressions can be designed using digital gates. The number of gates gets reduced if the expression can be minimized.	5 min
4	**Question / Answer** Q1 Design a logic equation using basic gates Q2 Design an Ex-NOR gate using only four NOR gates	5 min

Assignment to be given:-
Q4 Design an equivalent of Ex-OR gate using minimum number of NAND gates only

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-7

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- Designing using NAND & NOR gates	Time Allotted:-
1.	**Introduction** NAND & NOR gates are known as universal gates because these can design any type of logic expression. NOR gate is equivalent to an OR gate followed by an inverter. Similarly NAND gate is equivalent to AND gate followed by an inverter.	5 min
2	**Division of the Topic** -Designing using NAND gates only -Designing using NOR gates only	35 min
3.	**Conclusion** NAND & NOR gates are universal gates and any digital circuit can be designed using these gates. This as preferred because only a single type of gates are used for the realization of logical expression.	5 min
4	**Question / Answer** Q1 Design an Ex-OR gate using NAND gates only Q2 Design an Ex-NOR gate using only four NOR gates	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-8

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- K-map, Simplification of logic expression	Time Allotted:-
1.	**Introduction** Simplification techniques of logical equations help in circuit minimization because it considerably reduce the no of terms in the logical expression so less no of gates are used for realization K-map is very easy to manipulate but K-map of more than 6 variables is very difficult to solve.	5 min
2	**Division of the Topic** -Minimization techniques -K-map	35 min
3.	**Conclusion** The number of gates and the number of input terminals for the gates required for the realization of a logical expression, in general, get reduced considerably if the expression can be simplified. K-map is an effective technique for solving of logical expressions.	5 min
4	**Question / Answer** Q1 Discuss various simplification techniques for logical equations A1 K-map method, Quine McClusky etc Q2 Simplify a given logic expression using K-map	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-9

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- K-map simplification	Time Allotted:-
1.	**Introduction** This is a simplification technique of logical equations. This helps in circuit minimization. K-map is very easy to manipulate but K-map of more than 6 variables is to solve.	5 min
2	**Division of the Topic** -Simplification of SOP form -Simplification of POS form	35 min
3.	**Conclusion** The number of gates and the number of input terminals for the gates required for the realization of a logical expression, in general, get reduced considerably if the expression can be simplified. K-map is an effective technique for solving of logical expressions	5 min
4	**Question / Answer** Q1 Simplify a given logic expression in SOP form using K-map Q2 Simplify a given logic expression in POS form using K-map	5 min

Assignment to be given:-

Q1 Solve the following using K-map

$f(A,B,C,D)= \sum m (0,1,2,5,7,9,12,14)$

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-10

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- Quine McClusky method of simplification	Time Allotted:-
1.	**Introduction** Quine McClusky is a simplification technique of logical equations. This is a tabular method and easy to Understand. This eliminates the problem of K-map of more than 6 variables.	5 min
2	**Division of the Topic** -Quine McClusky method of simplification -Problems related to minimization	35 min
3.	**Conclusion** Quine McClusky technique of simplification can be used for the minimization of logical expressions. Any number of variables expressions can be minimized using this.	5 min
4	**Question / Answer** Q1 Simplify a given logic expression in SOP form using Quine McClusky method Q2 Simplify a given logic expression in POS form using Quine McClusky method	5 min

Assignment to be given:-

Q1 Solve the following using Quine McClusky method

$f=\sum m\ (2, 4, 6, 9, 11, 13, 15) + d\ (0, 8, 12)$

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-11

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- Quine McClusky	Time Allotted:-
1.	**Introduction** This is a simplification technique of logical expressions. This is a tabular method and easy to understand. This eliminates the problem of K-map of more than 6 variables.	5 min
2	**Division of the Topic** -Problems of minimization -Simplification of SOP form	35 min
3.	**Conclusion** Quine McClusky technique of simplification is used for circuit minimization by reducing the number of terms in the logical expression.	5 min
4	**Question / Answer** Q1 Simplify a given logic expression in SOP form using Quine McClusky method Q2 Simplify a given logic expression in POS form using Quine McClusky method	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-12

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - II

S. No.	Topic :- Quine McClusky	Time Allotted:-
1.	**Introduction** This is a simplification technique of logical expressions. This is a tabular method and easy to understand. This eliminates the problem of K-map of more than 6 variables.	5 min
2	**Division of the Topic** -Problems of minimization -Simplification of SOP form	35 min
3.	**Conclusion** Quine McClusky technique of simplification is used for circuit minimization by reducing the number of terms in the logical expression.	5 min
4	**Question / Answer** Q1 Simplify a given logic expression in SOP form using Quine McClusky method Q2 Simplify a given logic expression in POS form using Quine McClusky method	5 min

Assignment to be given: - Nil

Reference Readings:-

1 Digital Electronics by R.P.Jain
2 Digital Fundamentals by Thomas L. Floyd
3 Digital Principles by Morris Mano

Lecture Plan-13

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Multiplexer and realization using multiplexer	Time Allotted:-
1.	**Introduction** Multiplexer is known as data selector. It gates out one out of many inputs to a single output. The input selected is controlled by a set of select inputs. By applying control signal we can steer any input to the output.	5 min
2	**Division of the Topic** -Multiplexer basics -Multiplexer circuit using gates -Designing using multiplexer	35 min
3.	**Conclusion** Multiplexer is used as data selector and we can use it for the realization of various logical equations also. This can be used where we want to select only one input out of many inputs.	5 min
4	**Question / Answer** Q1 What is multiplexer A1 Multiplexer is data selector which selects one out of many inputs Q2 Realize given expression using multiplexer	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-14

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Multiplexer tree & problems	Time Allotted:-
1.	**Introduction** Since 16-to-1 multiplexers are the largest available IC's therefore to meet the larger inputs need there should be a provision for expansion. This can be achieved with the help of enable/strobe inputs and multiplexer trees are designed.	5 min
2	**Division of the Topic** -Multiplexer tree -Problems solving using multiplexer	35 min
3.	**Conclusion** We can design a larger number of input multiplexer by using a less number of input multiplexer. By this we can realize larger number of variables expressions using multiplexers.	5 min
4	**Question / Answer** Q1 What is multiplexer tree A1 Multiplexer tree means combining many multiplexers Q2 Realize given expression using multiplexer	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-15

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Demultiplexer & realization using demultiplexer	Time Allotted:-
1.	**Introduction** Demultiplexer performs reverse function of the multiplexer. It has only one input and many output lines. The output line is selected by using select inputs.	5 min
2	**Division of the Topic** -Demultiplexer basics and block diagram -Realization using demultiplexer -Demultiplexer tree	35 min
3.	**Conclusion** Demultiplexer can be used in realization of circuits and it an also be used as a decoder also. By taking the select inputs as input and the output lines as output lines the demultiplexer can work as a decoder.	5 min
4	**Question / Answer** Q1 What is demultiplexer A1 Demultiplexer has only one input and it sends that on one of the many output lines Q2 Realize given expression using demultiplexer	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-16

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Decoder and its types	Time Allotted:-
1.	**Introduction** Decoder does the opposite function of encoder. BCD to decimal decoder is an example of decoder which converts BCD code into equivalent decimal number.	5 min
2	**Division of the Topic** -Decoder circuit -BCD to decimal decoder	35 min
3.	**Conclusion** Decoder acts the opposite function of the encoder. It converts the coded signal into original form.	5 min
4	**Question / Answer** Q1 What is Decoder A1 Decoder is a circuit which converts the coded input into its original number system Q2 Design a BCD to Decimal Decoder	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-17

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Adders and its types, Sub tractor and its types	Time Allotted:-
1.	**Introduction** Adders are the circuits used for the addition of the bits. There are mainly two type of Adders; Half adder and Full adder. Sub tractor is a circuit for subtraction of bits. It is also of mainly two types; Half sub tractor and Full sub tractor.	5 min
2	**Division of the Topic** -Half adder -Full adder -Half sub tractor -Full sub tractor -Parallel adders -Difference between serial adder and parallel adder	35 min
3.	**Conclusion** Adders can be user in addition of digital data. Parallel adder increases the speed of addition but these require more hardware as compared to the serial adders.	5 min
4	**Question / Answer** Q1 How many inputs are in the one bit half adder A2 two Q2 What is the difference between serial adder and parallel adder A2 In serial adder the bits are added serially but in parallel adder the bit are added parallely	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-18

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- BCD arithmetic , BCD adders	Time Allotted:-
1.	**Introduction** BCD means Binary Coded Decimal. In this each digit is represented by four binary bit number. BCD adder is used for the addition of BCD numbers. In this if the result of the addition is an invalid BCD number then we add six in the result.	5 min
2	**Division of the Topic** -BCD addition -BCD subtraction -BCD adder circuit	35 min
3.	**Conclusion** BCD number requires more number of bits to code a decimal number than using the straight binary code. In spite of this disadvantage it is very convenient and useful code for input and output operations in digital systems.	5 min
4	**Question / Answer** Q1 BCD number of $(3)_{10}$ A1 0011 Q2 Add two BCD numbers 0010 and 0100 A2 0110	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-19

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- BCD sub tractor, Adders and its use as sub tractor	Time Allotted:-
1.	**Introduction** BCD sub tractor is a circuit for the subtraction of the BCD numbers. If the result of the subtraction is a invalid BCD number then six is added to the result. Adders can also be used as sub tractors because in 1's and 2's complement subtraction we add the 1's or 2's complement of the subtrahend to the minuend.	5 min
2	**Division of the Topic** -BCD sub tractor -1's complement subtraction -2's complement subtraction	35 min
3.	**Conclusion** Adders can also be used as sub tractors because in 1's complement and 2's complement subtraction instead of subtracting we add the 1's complement or 2's complement of subtrahend to the minuend	5 min
4	**Question / Answer** Q1 Design a one bit BCD sub tractor Q2 Subtract two numbers using 1's complement Q3 Subtract two numbers using 2's complement	5 min

Assignment to be given:-
Q1 Design a one bit BCD sub tractor circuit

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-20

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - III

S. No.	Topic :- Encoder and its types, Decoder/Drivers for display devices	Time Allotted:-
1.	**Introduction** Encoder is a circuit which converts the active input data into a coded output. e.g. decimal to BCD encoder. We also use decoders or drivers circuits for driving the display devices like LED's.	5 min
2	**Division of the Topic** -Encoder basics -Decoder/drivers for display devices -BCD to seven segment decoder/driver circuit	35 min
3.	**Conclusion** Coded signal is generally used in transmission of data because no one can trace the data	5 min
4	**Question / Answer** Q1 What is a Encoder A1 Encoder is a circuit that converts input data into coded output Q2 Design an Decimal to BCD encoder	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Moris mano

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Lecture Plan-21

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Flip-Flop:- S-R and J-K type	Time Allotted:-
1.	**Introduction** Flip-Flop is basically a memory element that can store one bit of information. It is a bistable device. It is having two outputs, both are complement of each other. S-R F/F Is a type of flip flop in which the input condition of both the inputs being one	5 min
2	**Division of the Topic** -Basic Latch circuit -Flip-Flop circuit using NAND gates -S-R Flip/Flop -J-K Flip/Flop	35 min
3.	**Conclusion** Flip Flop is a storage circuit that can store one bit data. It is very much helpful in the designing of sequential circuits as the output of sequential circuits depends upon present input as well as previous output. So memory element is necessary in these.	5 min
4	**Question / Answer** Q1 What is a Flip Flop A1 Flip flop is a memory element that can store one bit data Q2 Design a S-R flip flop	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-22

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- T and D type flip flops	Time Allotted:-
1.	**Introduction** Toggle and Delay type flip flop. One flip flop is converted into another type of flip flop by using excitation table. The excitation table determines the inputs when the output conditions are given.	5 min
2	**Division of the Topic** -T type flip flop -D type flip flop -Excitation table of various flip flops table	35 min
3.	**Conclusion** The excitation table of flip flop helps in conversion of one flips flop into another and also in the designing of the counters. The D type flip flop can be used for inserting time delay in the circuit.	5 min
4	**Question / Answer** Q1 Design T type flip flop Q2 Convert S-R flip flop into J-K flip flop	5 min

Assignment to be given:-
Q1 Convert S-R flip flop into J-K flip flop

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-23

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Conversion from one Flip-flop to another	Time Allotted:-
1.	**Introduction** Toggle and Delay type flip flop. One flip flop is converted into another type of flip flop by using excitation table. The excitation table determines the inputs when the output conditions are given.	5 min
2	**Division of the Topic** -Excitation table of various flip flops table	35 min
3.	**Conclusion** The excitation table of flip flop helps in conversion of one flips flop into another and also in the designing of the counters. The D type flip flop can be used for inserting time delay in the circuit.	5 min
4	**Question / Answer** Q1 Design T type flip flop Q2 Convert S-R flip flop into J-K flip flop	5 min

Assignment to be given:-
Q1 Convert S-R flip flop into J-K flip flop

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano

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Lecture Plan-24

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Master-Slave F/F and edge triggered F/F	Time Allotted:-
1.	**Introduction** The Race Around problem in J-K flip flop is eliminated by using Master Slave flip flop. In this two flip flops are cascaded; one is master and other follows the other And known as slave	5 min
2	**Division of the Topic** -Master Slave flip flop -Edge Triggering circuit -Edge Triggered flip flop	35 min
3.	**Conclusion** The Race Around problem is eliminated by using Master Slave flip flop. Another method for this is using edge triggered flip flops.	5 min
4	**Question / Answer** Q1 What is Race Around problem A1 In this the output of flip flop oscillates between 0 and 1 due to transmission delay Q2 What is Master Slave Flip Flop Q3 How do we eliminate the Race Around problem A3 By using Master Slave flip flop and Edge triggered flip flop	5 min

Assignment to be given:-
Q1 Write a short note on Master Slave J-K flip flop

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-25

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Shift registers and types:- SISO and SIPO	Time Allotted:-
1.	**Introduction** Registers are used for the storage of digital data. There are mainly four types of registers. SISO is serial in serial out and other is SIPO serial in parallel out shift register.	5 min
2	**Division of the Topic** -Register and its types -Serial In Serial Out shift register -Serial In Parallel Out shift register	35 min
3.	**Conclusion** Flip flop can store only one bit of data. So in order to store a multi bit data we combine flip flops to form a register.	5 min
4	**Question / Answer** Q1 What is a register A1 Register is a combination of flip flops and used for storage of multi bit data Q2 Draw the timing diagram of SISO shift register for the input 101011	5 min

Assignment to be given:-
Q1 Write short note on the following
` i) Ring Counter
ii) Shift Register

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-26

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Shift registers:- PISO and PIPO	Time Allotted:-
1.	**Introduction** PISO and PIPO shift registers are parallel in serial out and parallel in parallel out shift register. In both the registers the data input is inserted in parallel form.	5 min
2	**Division of the Topic** Parallel In Serial Out shift register Parallel In Parallel Out shift register Bidirectional shift register	35 min
3.	**Conclusion** Shift registers only shift the data input across it and we can store any type of digital data in it. The PIPO is very fast as the input and output both are parallel.	5 min
4	**Question / Answer** Q1 What is bidirectional shift register? Draw its timing waveform A1 This type of register can shift the bits in both the directions left and right Q2 Design a 4 bit PIPO shift register and explain its working	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-27

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Sequence generator and Counters:- Synchronous and Asynchronous	Time Allotted:-
1.	**Introduction** A circuit which generates a prescribed sequence of bits, in synchronism with a clock is referred to as a sequence generator. Counters are those circuits which are used for the counting of pulses. These are mainly of two types; synchronous and asynchronous	5 min
2	**Division of the Topic** -Sequence generator -Counter and its types -Synchronous counters -Asynchronous counters	35 min
3.	**Conclusion** Counters are very useful in digital electronics as these can be used for measuring time and therefore period and frequency.	5 min
4	**Question / Answer** Q1 What is a counter A1 Counter is a circuit that counts pulses. Q2 What is the difference between synchronous and asynchronous counters A2 In synchronous counter the same clock pulse is applied to every flip flop while in asynchronous counter the output of one flip flop is the clock pulse of second and so on Q3 What is the modulus of a counter A3 Modulus of a counter is the number of stages up to which the counter counts	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-28

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Ring Counter, Johnson's counter.	Time Allotted:-
1.	**Introduction** Ring counter and Johnson's counter are a modified form of shift registers. Decade counter is a type of counter which counts from 0 to 9 only. Up-Down counter can count in both the directions (up and down).	5 min
2	**Division of the Topic** -Ring counter -Johnson's counter -Decade counter	35 min
3.	**Conclusion** Ring counter and Johnson counter are modified form of shift registers. The modulus of ring counter is 2N and the modulus of Johnson counter is N	5 min
4	**Question / Answer** Q1 Design a 4 bit Ring counter Q2 What do you mean by Decade counter A2 Decade counter counts from 0 to 9 i.e. only 10 stages Q3 Draw a 4 bit Up Down counter	5 min

Assignment to be given:-
Q1 Design a synchronous Decade counter

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-29

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Explain theUp-Down counter, , Decade counter	Time Allotted:-
1.	**Introduction** Decade counter is a type of counter which counts from 0 to 9 only. Up-Down counter c count in both the directions (up and down).	5 min
2	**Division of the Topic** -Decade counter -Up-Down counter	35 min
3.	**Conclusion** The modulus of ring counter is 2N and the modulus of Johnson counter is N	5 min
4	**Question / Answer** Q1 Design a 4 bit Ring counter Q2 What do you mean by Decade counter A2 Decade counter counts from 0 to 9 i.e. only 10 stages Q3 Draw a 4 bit Up Down counter	5 min

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Lecture Plan-30

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - IV

S. No.	Topic :- Design of Synchronous and Asynchronous sequential circuits	Time Allotted:-
1.	**Introduction** Synchronous circuits are those circuits which are in synchronism with same clock pulse. While asynchronous circuits are not in synchronism with each other.	5 min
2	**Division of the Topic** -Design of synchronous circuits -Design of asynchronous circuits	35 min
3.	**Conclusion** Synchronous counters are faster than asynchronous counters. But asynchronous counters are simpler in construction and require less hardware.	5 min
4	**Question / Answer** Q1 Design a 3 bit synchronous counter Q2 How many flip flops are required for designing a 4 bit synchronous counter A2 4 flip flops	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-31

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - V

S. No.	Topic :- P-N junction, Bipolar and MOS	Time Allotted:-
1.	**Introduction** Bipolar devices are those devices in which the current flows due to both majority and minority carriers. MOS is Metal Oxide Semiconductor device.	5 min
2	**Division of the Topic** -P-N junction and it's switching characteristics -Bipolar and MOS devices	35 min
3.	**Conclusion** Switching characteristics of diode limits the speed of operation of the diode. The RTL was the most popular form of logic before the development of ICs.	5 min
4	**Question / Answer** Q1 Draw the switching characteristics of p-n junction diode Q2 What is the difference between bipolar and unipolar devices	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-32

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - V

S. No.	Topic :- Bipolar logic families : RTL,DTL,DCTL, HTL, TTL	Time Allotted:-
1.	**Introduction** Bipolar devices are those devices in which the current flows due to both majority and minority carriers. MOS is Metal Oxide Semiconductor device.	5 min
2	**Division of the Topic** -Bipolar and MOS devices - Digital logic families like RTL, DTL, DCTL, HTL, TTL	35 min
3.	**Conclusion** Switching characteristics of diode limits the speed of operation of the diode. The RTL was the most popular form of logic before the development of ICs. DTL has greater fan-out and improved noise margin.	5 min
4	**Question / Answer** Q1 Draw the switching characteristics of p-n junction diode Q2 What is the difference between bipolar and unipolar devices	5 min

Assignment to be given: - Nil

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano

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Lecture Plan-33

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - V

S. No.	Topic :- ECL, MOS, CMOS, Tri-State logic.	Time Allotted:-
1.	**Introduction** Various types of digital logic families are discussed in this by which we can design digital gates and other digital circuits.	5 min
2	**Division of the Topic** -Digital logic families like ECL, CMOS -Tri state logic	35 min
3.	**Conclusion** ECL is the fastest logic family. CMOS has an advantage of very low power consumption.	5 min
4	**Question / Answer** Q1 Which one is the fastest logic family A1 ECL Q2 Discuss various advantages of CMOS logic family A2 very low power consumption	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-34

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - V

S. No.	Topic:- Interfacing of CMOS and TTL.	Time Allotted:-
1.	**Introduction** Various types of digital logic families are discussed in this by which we can design digital gates and other digital circuits.	5 min
2	**Division of the Topic** - Interfacing of CMOS and TTL	35 min
3.	**Conclusion** ECL is the fastest logic family. CMOS has an advantage of very low power consumption.	5 min
4	**Question / Answer** Q1 Which one is the fastest logic family A1 ECL Q2 Discuss various advantages of CMOS logic family A2 very low power consumption	5 min

Assignment to be given: - Nil

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano

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Lecture Plan-35

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VI

S. No.	Topic :- Sample & Hold circuit, weighted resistor & R-2R D/A converter	Time Allotted:-
1.	**Introduction** DAC are digital to analog converters. Weighted resistor type and R-2R type DAC are discussed. Specifications of DAC's like Accuracy, Settling time are also discussed.	5 min
2	**Division of the Topic** -Weighted resistor type DAC -R-2R type DAC -Specifications of DAC	35 min
3.	**Conclusion** The digital data can be converted into analog data by DAC. Parallel comparator is the fastest ADC	5 min
4	**Question / Answer** Q1 What is D to A converter? What are its types A1 this converts digital input into analog output Q2 Which one is the fastest ADC A2 Parallel comparator ADC	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-36

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VI

S. No.	Topic :- Specification of DAC, Quantization, Parallel comparator	Time Allotted:-
1.	**Introduction** DAC are digital to analog converters. Weighted resistor type and R-2R type DAC are discussed. Specifications of DAC's like Accuracy, Settling time are also discussed.	5 min
2	**Division of the Topic** -Specifications of DAC -Quantization -Parallel Comparator type ADC	35 min
3.	**Conclusion** The digital data can be converted into analog data by DAC. Parallel comparator is the fastest ADC	5 min
4	**Question / Answer** Q1 What is D to A converter? What are its types A1 this converts digital input into analog output Q2 Which one is the fastest ADC A2 Parallel comparator ADC	5 min

Assignment to be given: - Nil

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano

Lecture Plan-37

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VI

S. No.	Topic :- Successive Approximation Analog to digital converter (ADC).	Time Allotted:-
1.	**Introduction** The most accurate type ADC is Dual Slope type ADC. Specifications of ADC's like Accuracy, Format of Digital output is also discussed.	5 min
2	**Division of the Topic** Successive Approximation type ADC	35 min
3.	**Conclusion** Dual Slope is having very good accuracy and is most popular type of ADC which is widely used in instruments such as digital voltmeters where the conversion speed is not important..	5 min
4	**Question / Answer** Q1 Write the specifications of ADCs Q2 Explain the working of Dual Slope ADC	5 min

Assignment to be given: - Nil

Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

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Lecture Plan-38

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VI

S. No.	Topic :- Dual Slope ADC, Specification of ADC	Time Allotted:-
1.	**Introduction** The most accurate type ADC is Dual Slope type ADC. Specifications of ADC's like Accuracy, Format of Digital output is also discussed.	5 min
2	**Division of the Topic** - Dual Slope type ADC - Specifications of ADC's	35 min
3.	**Conclusion** Dual Slope is having very good accuracy and is most popular type of ADC which is widely used in instruments such as digital voltmeters where the conversion speed is not important..	
4	**Question / Answer** Q1 Write the specifications of ADCs Q2 Explain the working of Dual Slope ADC	5 min 5 min

Assignment to be given: - Nil

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano

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Lecture Plan-39

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VII

S. No.	Topic: - ROM, PLA, PAL.	Time Allotted:-
1.	**Introduction** These are programmable logic devices. A programmable logic device is an IC that is user configurable and is capable of implementing logic functions. It is an LSI chip that contains a regular structure and allows the designer to customize it for any specific application i.e. it is programmed by the user to perform a function required for his application.	5 min
2	**Division of the Topic** -ROM(Read Only Memory) as PLD -PLA(Programmable Logic Array) and PAL(Programmable Array Logic)	35 min
3.	**Conclusion** These types of devices help in designing of very complex circuits. These reduce the board space requirement and reduced power requirement.	5 min
4	**Question / Answer** Q1 Discuss various programmable devices Q2 What is PLA A2 Programmable Logic Array Q3 What are the advantages of FPGA over PLA A3 Complex circuit can be designed easily	5 min

Assignment to be given: - Nil
Reference Readings:-

1) Digital Electronics by R.P.Jain
2) Digital Fundamentals by Thomas L. Floyd
3) Digital Principles by Morris Mano

Lecture Plan-40

Semester: - III Class: - EEE Course Code: - EE-204-F

Subject: - Digital Electronics Unit: - VII

S. No.	Topic:- FPGA & CPLD's	Time Allotted:-
1.	**Introduction** These are programmable logic devices. A programmable logic device is an IC that is user configurable and is capable of implementing logic functions. It is an LSI chip that contains a regular structure and allows the designer to customize it for any specific application i.e. it is programmed by the user to perform a function required for his application.	5 min
2	**Division of the Topic** -FPGA(Field Programmable Gate Array) -CPLD's(Complex Programmable Logic Devices)	35 min
3.	**Conclusion** These types of devices help in designing of very complex circuits. These reduce the board space requirement and reduced power requirement.	5 min
4	**Question / Answer** Q1 Discuss various programmable devices Q2 What is PLA A2 Programmable Logic Array Q3 What are the advantages of FPGA over PLA A3 Complex circuit can be designed easily	5 min

Assignment to be given: - Nil

Reference Readings:-

4) Digital Electronics by R.P.Jain
5) Digital Fundamentals by Thomas L. Floyd
6) Digital Principles by Morris Mano