Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title: Digital Electronics Lab		Course Code: 15MC23P
Mode (L:T:P) : 0:2:4	Credits:3	Core/ Elective: Core
Type of Course Tutorials and Practical's		Total Contact Hours: 78
CIE-25 Marks		SEE-50 Marks

Prerequisites: Knowledge of Fundamentals of Digital Electronics

Course Objectives: Understand the use of digital ICs, IC tester and simple design aspects of digital Circuits

Course outcomes: At the end of the course the student is able to

1. Identify various digital IC's configuration & their working
2. Verify different Laws practically.
3. Implement & verify various Boolean functions through logic gates.
4. Implement & verify Combinational Logic circuits and Sequential Logic Circuits.

Course Outcome		Cognitive Level	Linked with PO	Teaching Hours
CO1	Identify various digital IC's configuration & their working	*A*	1,2,3	18
CO2	Verify different Laws practically	*A*	1,2,3	18
CO3	Implement & verify various Boolean functions through logic gates	*A*	1,2,3	24
CO4	Implement & verify Combinational Logic circuits and Sequential Logic Circuits	*A*	1,2,3	18
		Total sessions		**78**

Legend: R; Remember, U: Understand A: Application

Mapping of Course Outcomes with Program Outcomes

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Digital Electronics Lab	**3**	**3**	**3**	-	-	-	-	-	-	-

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.

If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3

If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2

If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1

If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed.

Contents

1. Familiarisation of logic gates using IC's

   a)7404 b)7432 c)7408 d)7400 e)7402 f)7486

2. Realization of NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NAND gates only.
3. Realization of NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NOR gates only.
4. Implement and verify Boolean expression using K-MAP.
5. Verification of De- Morgan's theorems.
6. Implement Half –Adder and Full-Adder circuits using logic gates.
7. Implement Half –Subtractor and Full-Subtractor circuits using logic gates.
8. Realize the following Flip-Flops.

   i) Clocked RS FF using NAND gates

   ii) JK FF using IC- 7476

   iii) T and D FF using IC- 7476

9. Realize Binary to Gray code and Gray to Binary code converter using 7486.
10. Realize 4 – bit even and Odd parity generator using EX- OR gates.
11. Perform 4 – Bit Parallel addition using IC- 7483.
12. Realize 2 – Bit comparator using IC- 7485.
13. Realize 1 to 8 De-Multiplexer using IC- 74138.
14. Realize 8 to 1 Multiplexer using 74151.
15. Realize the following types of Shift Registers using IC-7495.

a)SISO b)SIPO c)PISO d)PIPO

16. Realize UP-DOWN Counter using IC- 74193.
17. Realize Decade counter using IC- 7490.

Reference Books:

1. Fundamentals of Digital Circuits – A. Anandkumar , 3 rd edition,PHI publication.
2. Digital Electronics and Logic Design – JaydeepChakravorty, UP publication.

e- Reference

1. **www.sriengg.com**
2. **www.ssit.edu.in**
3. **http://www.wiziq.com/tutorial/567997-digitalelectronicslecture/introduction**

4. www.authorstream.com/presentation/psureshvenugopal-1137243-digitalelectronicsbasics
5. http://cg.nic.in/bilaspur/ggpbsp3/LAB%20Manuals%20Viva%20pdf/Electronics%20&%20Telecommunication%20Deptt%20pdf/Digital%20Lab2/Digital%20Electronics%20%20Lab%20Manual.pdf

Contents linked with Co and PO

Sl No	Contents	CO	PO
1	Familiarization of logic gates using IC' a)7404 b)7432 c)7408 d)7400 e)7402 f)7486	1	1,2,3
2	Realization of NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NAND gates only	1	1,2,3
3	Realization of NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NOR gates only	1	1,2,3
4	Implement and verify Boolean expression using K-MAP	1	1,2,3
5	Verification of De- Morgan's theorems	1	1,2,3
6	Implement Half –Adder and Full-Adder circuits using logic gates	2	1,2,3
7	Implement Half –Subtractor and Full-Subtractor circuits using logic gates.	2	1,2,3
8	Realize the following Flip-Flops. i) Clocked RS FF using NAND gates ii) JK FF using IC- 7476 iii) T and D FF using IC- 7476	2	1,2,3
9	Realize Binary to Gray code and Gray to Binary code converter using 7486	2	1,2,3
10	Realize 4 – bit even and Odd parity generator using EX- OR gates.	3	1,2,3
11	Perform 4 – Bit Parallel addition using IC- 7483	3	1,2,3
12	Realize 2 – Bit comparator using IC- 7485	3	1,2,3
13	Realize 1 to 8 De-Multiplexer using IC- 74138	3	1,2,3
14	Realize 8 to 1 Multiplexer using 74151	3	1,2,3
15	Realize the following types of Shift Registers using IC-7495. a)SISO b)SIPO c)PISO d)PIPO	3	1,2,3
16	Realize UP-DOWN Counter using IC- 74193.	3	1,2,3
17	Realize Decade counter using IC- 7490	4	1,2,3

Student Activity

Activity No	Description of the Activity
1	Simulate a realistic digital circuit containing logic gates
2	Collect the information about any three digital systems and highlight the difference between analog and digital systems.

Note:

1. Each student should do above activity or any other similar activity related to the course COs and get it approved from concerned Teacher and HOD.
2. No student should have activity repeated or similar
3. Teacher should ensure activities by group must cover all COs
4. Teacher should asses every student by using suitable **Rubrics** approved by HOD

Rubrics

Dimension	Exemplary	Accomplished	Developing	Beginning	Roll No. of the Student				
	5/4	3	2	1	1	2	3	4	5
Organization	Information presented in logical, interesting sequence	Information in logical sequence	Difficult to follow presentation--student jumps around	Cannot understand presentation--no sequence of information	2				
Subject Knowledge	Demonstrates full knowledge by answering all class questions with explanations and elaborations	At ease with expected answers to questions but does not elaborate	Uncomfortable with information and is able to answer only rudimentary questions	Does not have a grasp of the information. Cannot answer questions about subject	3				
Graphics	Explain and reinforce screen text and presentation	Relate to text and presentation	Occasionally uses graphics that rarely support text and presentation	Uses superfluous graphics or no graphics	4				
Oral Presentation	Maintains eye contact and pronounces all terms precisely. All audience members can hear	Maintains eye contact most of the time and pronounces most words correctly. Most audience members can hear presentation	Occasionally uses eye contact, mostly reading presentation, and incorrectly pronounces terms. Audience members have difficulty hearing	Reads with no eye contact and incorrectly pronounces terms. Speaks too quietly	5				
Total Score=(2+3+4+5)=14/4=3.5=4									

Course Assessment Pattern

Particulars			Max Marks	Evidence	Course Outcomes
Direct Assessment	**CIE**	Two test (Average of Two tests)	10	Blue books	1,2,3 &4
		Practical record	10	Practical record	1,2,3 &4
		Student Activity	05	Student Activity Sheets	1,2,3 &4
	SEE	End of the course	50	Answer scripts at BTE	1,2,3 &4
Indirect Assessment	**Student Feedback on course**	Middle of the course		Feedback forms	1 &2
		End of the course		Feedback forms	3 &4

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note:

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Student activities.

Scheme of valuation for SEE

Sl. No.	Performance	Max. Marks
1	Writing logic diagram, truth table & procedure for one experiment.	15
2	Conduction of experiment	20
3	Result	05
5	Viva Voce	10
	TOTAL	**50**

Equipment required for Digital Electronics Lab

Sl. No	Name of equipment	Numbers Required as per norms
1.	Digital Trainer Kit	10
2.	Logic Probe	05
3.	Digital IC Tester (Not PC based)	02
4.	Patch cards	500
5.	Dual Trace CRO 20 MHz	02
6.	VRPS + or – 5v,12v/2A	10
7.	Digital Multimeter	10

Model Question Bank

1. Write the logic symbol and Verify the truth table of the following logic gates using ICs
   a)7404 b)7408 c)7432 d)7400 e)7402 f)7486
2. Realize and verify the NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NAND gates only.
3. Realize and verify of NOT, OR, AND, NOR, EX-OR and EX-NOR gates using NOR gates.
4. Simplify the Boolean expression Y(A,B,C) = ∑m(0,2,5,7) using K-MAP. Implement the same using logic gates and verify its truth table.
5. Simplify the Boolean expression(A,B,C,D) = ∑m(0,2,5,7,8,10,13,15) using K-map .Implement the same using logic gates and verify its truth table..
6. State and verify the De- Morgan's theorems.
7. Construct Half –Adder and Full-Adder circuits using logic gates and verify the truth tables.
8. Construct Half –Subtractor and Full-Subtractor circuits using logic gates and verify the truth tables.
9. Construct and Verify the truth table of Clocked S-R Flip-Flop using NAND gates
10. Construct and Verify the truth table of JK Flip-Flop, T Flip-Flop & D Flip-Flop using IC -7476
11. Construct and verify Binary to Gray code and Gray to Binary code converter using

IC- 7486.

12. Construct and Verify 4 -bit Even and Odd parity generator using EX- OR gates.
13. Construct and Verify 4- Bit Parallel addition using IC- 7483.
14. Construct and Verify 2-Bit comparator using IC- 7485.
15. Construct and Verify 1 to 8 De-Multiplexer using IC- 74138.
16. Construct and Verify 8 to 1 Multiplexer using IC-74151.
17. Implement and verify the following types of Shift Registers using IC- 7495.
    a) SISO b) SIPO c) PISO d) PIPO
18. Implement UP-DOWN Counter using IC - 74193 and verify the truth table.
19. Implement Decade counter using IC- 7490 and verify the truth table.