Sri Indu
College of Engineering & Technology
UGC Autonomous Institution
Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH
Estd.2001

NAAC
NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

HANDOUT

Third Year ECE- Semester II

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC YEAR 2020-21

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

HANDOUT- INDEX

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

INSTITUTION VISION

To be a premier Institution in Engineering & Technology and Management with competency, values and social consciousness.

INSTITUTION MISSION

IM1 Provide high quality academic programs, training activities and research facilities.

IM2 Promote Continuous Industry-Institute interaction for employability, Entrepreneurship, leadership and research aptitude among stakeholders.

IM3 Contribute to the economical and technological development of the region, state and nation.

DEPARTMENT VISION

To be a centre of excellence in Electronics and Communication Engineering Education to produce professionals for ever-growing needs of society.

DEPARTMENT MISSION

The Department has following Missions:

DM1 To promote and facilitate student- centric learning.

DM2 To involve in activities that enable overall development of stakeholders.

DM3 To provide holistic environment with state-of-art facilities for students to develop solutions for various social needs.

DM4 Organize trainings in embedded systems with Industry interaction.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO	Statements
PEO1	To Attain technical competence for successful career in ECE profession
PEO2	Pursue higher studies with emphasizing design, test and development of the systems to meet the industry needs.
PEO3	Become entrepreneur by practicing ethics, professional integrity and leadership qualities.

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)

PO	Description
PO 1	**Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design / development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change
Program Specific Outcomes	
PSO 1	To nurture and empower the SICET-ECE students strong in practical, technical and research domains in the areas of Signal/Image processing, VLSI and wireless Communication.
PSO 2	To design and develop a prototype system that will incorporate user requirements using modern devices and emerging technology for industry automations.
PSO 3	To make the SICET-ECE students as successful industry ready engineers by imparting essential interpersonal skills and widespread exposure on multi-disciplinary technologies

COs MAPPING WITH POs & PSOs

VLSI DESIGN

At the end of the course student will be able to:

Course Outcomes	Statements
C324.1	Describe the fabrication process of integrated circuit using MOS transistors. (K2-Understand)
C324.2	Choose an appropriate inverter depending on specifications required for a circuit. (K4-Analyze)
C324.3	Sketch the layout and estimate parasitic of any logic circuit. (K3-Apply)
C324.4	Design different types of logic gates using CMOS inverter. (K6- Create)
C324.5	Design building blocks of data path using gates and memories using MOS transistors. (K6-Create)
C324.6	Design Programmable logic devices and interpret the concept of testing to improve testability of system. (K6-Create)

Course Articulation Matrix:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C324.1	3	2	-	-	-	-	-	-	-	-	-	3	3	2.5	-
C324.2	3	3	3	2	-	-	-	-	-	-	-	3	3	2.5	-
C324.3	3	3	3	2	-	-	-	-	-	-	-	2	3	3	-
C324.4	3	3	3	3	-	-	-	-	-	-	-	3	3	2	-
C324.5	3	3	3	3	-	-	-	-	-	-	-	2	3	2	-
C324.6	3	3	3	3	-	-	-	-	-	-	-	2	3	2	-
C324	**3**	**2.8**	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.5**	**3**	**2.3**	**-**

ANTENNAS AND WAVE PROPAGATION

At the end of the course student will be able to:

Course Outcomes	Statements
C321.1	Explain basic terminology and concepts of Antennas (K2 Understanding).
C321.2	Discuss the basic parameters those are considered in the antenna design process and the analysis (K2 Understanding).
C321.3	Calculate the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis (K3 apply).
C321.4	Select designed antennas and field evaluation under various conditions (K4 Analyse).
C321.5	Design antennas that suits the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure (K6 Creating).
C321.6	Design the bench setup for antenna parameter measurement of testing for their effectiveness (K6 Creating).

Course Articulation Matrix

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C321.1	3	-	3	-	-	2	-	-	-	-	-	-	3	2	-
C321.2	3	2	3	-	2	2	-	-	-	-	-	-	3	3	-
C321.3	3	3	3	-	2	3	-	-	-	-	-	-	3	3	-
C321.4	3	3	2	-	2	3	-	-	-	-	-	-	3	2	-
C321.5	3	3	3	-	2	3	-	-	-	-	-	-	3	3	-
C321.6	3	3	3	-	3	3	-	-	-	-	-	-	3	2	-
C321	**3**	**2.7**	**2.8**	**-**	**2.2**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.5**	**-**

EMBEDDED SYSTEM DESIGN (C413)

At the end of the course student will be able to:

Course Outcomes	Statements
C323.1	Explain the history, classification, characteristics, applications, quality attributes and purpose of embedded systems (K2-Understand)
C323.2	Describe the core of the embedded systems and categorize the types of memories and memory selection sensors and actuators and communication interfaces (K2-Understand)
C323.3	Apply the various embedded systems hardware circuits and embedded firmware design approaches and Development languages (K3-Apply)
C323.4	Discuss the basics of Operating systems and RTOS and explain multitasking and multiprocessing. (K2-Understand)
C323.5	Select the task communication via shared memory Message Passing, Remote Procedure Call and Sockets and explain the Device Drivers (K4-Analyse)
C323.6	Predict the Task Communication/Synchronization Issues and Techniques, and choose an RTOS. (K5-Evaluate)

Course Articulation Matrix:

Course Outcome	PO 1	PO 2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
C323.1	3	-	2	3	3	-	-	-	-	-	-	-	3	2	-
C323.2	3	2	3	-	2	-	-	-	-	-	-	-	3	2	-
C323.3	3	-	3	2	3	-	-	-	-	2	-	-	3	3	-
C323.4	3	2	3	-	3	-	-	-	-	2	-	-	3	3	-
C323.5	3	2	2	-	2	-	-	-	-	-	-	-	3	3	-
C323.6	3	3	2	-	3	-	-	-	-	2	-	-	3	3	-
C323	3	2.2	2.5	2.5	2.7	-	-	-	-	2	-	-	3	2.7	-

CONSUMER ELECTRONICS

At the end of the course student will be able to:

Course Outcomes	Statements
C325.1	summarize the consumer electronics fundamentals and explain about microprocessors and microcontrollers, energy management and intelligent building perspective (K2-Understand)
C325.2	Demonstrate Audio systems, Display systems, video systems and recording systems (K3- Apply)
C325.3	Describe the smart Home, Home Virtual Assistants, Home security systems and Different types of sensors (K2-Understand)
C325.4	Outline the home enablement systems like RFID Home, kitchen electronics and smart alarms, smart toilet, smart floor and smart locks. (K4-Analyse)
C325.5	Discuss cordless telephones, Fax machines PDA's TABLETs Smart phones and Smart watches.
C325.6	Compare and explain Android and iOS and demonstrate Video conferencing systems, Internet enabled systems, Wi-Fi, Li-Fi, GPS and Tracking systems. (K5-Evaluate)

DIGITAL SIGNAL PROCESSING (C326)

At the end of the course student will be able to:

Course Outcomes	Statements
C326.1	Restate time, frequency and Z - transform analysis on signals and systems. (K2 Understand)
C326.2	Differentiate the inter-relationship between DFT and various transforms. (K2 Understand)
C326.3	Analyze the Fast computation of DFT and appreciate the FFT processing (K4 Analyze)
C326.4	Analyze IIR Digital Filters for a given specifications (K4 Analyze)
C326.5	Design FIR Digital filters using Window Techniques. (K6 Create)
C326.6	Design FIR Digital filters using Window Techniques. (K6 Create)

Course Articulation Matrix

Course Outcome	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C326.1	3	3	2	-	-	2	-	-	-	-	-	-	3	2	-
C326.2	3	3	2	-	-	3	-	-	-	-	-	-	3	-	-
C326.3	3	3	3	-	-	2	-	-	-	-	-	-	3	-	-
C326.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-	-
C326.5	3	3	3	-	3	2	-	-	-	-	-	-	3	3	-
C326.6	3	3	3		3	2	-	-	-	-	-	-	3	-	-
C326	**3**	**3**	**2.6**	**-**	**2.6**	**2.2**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2.5**	**-**

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
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Sheriguda (V), Ibrahimpatnam, R.R.Dist, Hyderabad - 501 510

D4

BR-16 & BR-18

Lr.No. SICET/AUTO/DAE/Academic Calendar/203/2020

Dt: 08.12.2020

Dr.G. SURESH,
Principal,

To,
All the HODs

REVISED ACADEMIC CALENDAR

Sir,

Sub:SICET (Autonomous) - Academic & Evaluation – Revised Academic Calendar for **B.Tech – 2nd, 3rd & 4th Year** - For the academic year **2020-21** – Reg.

***

The approved Revised Academic Calendar for **B.Tech – 2nd, 3rd & 4th Year** for the Academic year **2020-21** is given below:

- **B.Tech 2nd Year for (2019 - 20 Batch) BR - 18 Regulation**
- **B.Tech 3rd Year for (2018 - 19 Batch) BR - 18 Regulation**
- **B.Tech 4th Year for (2017 - 18 Batch) BR - 16 Regulation**

Revised Academic Calendar for B.Tech – 2nd, 3rd & 4th Year Students

I Semester

Commencement of class work	**24.08.2020 (Monday)**	
I Spell of Instructions (Including CRT & Dasara Holidays)	24.08.2020	31.10.2020 – 10 Weeks
Regular End Semester Examinations of Previous Semester (Including Lab Exams)	02.11.2020	11.12.2020 - 6 Weeks
II Spell of Instructions	14.12.2020	13.02.2021 - 9 Weeks
I Mid Examinations for II, III & IV Year Students	21.12.2020	28.12.2020 - 1Week
II Mid Examinations for II, III & IV Year Students	15.02.2021	20.02.2021 - 1 Week
Practical Classes	22.02.2021	27.02.2021 - 1 Week
Preparations & Practical Examinations	01.03.2021	06.03.2021 - 1 Week
II, III & IV Semester End Examinations (Regular)	08.03.2021	20.03.2021 - 2 Weeks
Supplementary Examinations	22.03.2021	06.04.2021 - 2 Weeks
Commencement of class work of 2nd, 3rd & 4th Year II Semester - 22.03.2021 (Monday)		

II Semester

Commencement of class work	**22.03.2021 (Monday)**	
I Spell of Instructions	22.03.2021	15.05.2021 - 8 Weeks
Summer Vacation	17.05.2021	29.05.2021 - 2 Weeks
I Mid Examinations for II, III & IV Year Students	31.05.2021	05.06.2021 - 1 Week
II Spell of Instructions	07.06.2021	31.07.2021 - 8 Weeks
II Mid Examinations for II, III & IV Year Students	02.08.2021	07.08.2021 - 1 Week
Preparation & Project Evaluation (IV B.Tech)	09.08.2021	14.08.2021 - 1 Week
Preparations & Practical Examinations For (II &III B.Tech)	09.08.2021	14.08.2021 - 1 Week
End Semester Examinations for (II, III & IV B.Tech)	16.08.2021	28.08.2021 - 2 Weeks
Supplementary Examinations	31.08.2021	14.09.2021 - 2 Weeks
Commencement of class work for the A.Y 2021-22 01.09.2021 (Wednesday)		

ACE

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DEAN

PRINCIPAL

Copy to DAE, CONTROLLER OF EXAMINATIONS, Dy. Dean ACADEMIC AFFAIRS & EVALUATION

ADDITIONAL CONTROLLER OF EXAMINATIONS

PRINCIPAL
Sri Indu College of Engineering & Technology
(An Autonomous Institution under JNTUH)
Sheriguda (V), Ibrahimpatnam, R.R.Dist-501510

SRI INDU COLLEGE OF ENGINEERING AND TECHNOLOGY (AUTONOMOUS)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DEPARTMENT CALENDAR – 2020-2021 (SECOND SEMESTER)

DAYS	MARCH '21	APRIL '21	MAY '21	JUNE '21	JULY '21	AUGUST '21
SUNDAY						
MONDAY	1				1 MID I EXAM	
TUESDAY	2				2 MID I EXAM	
WEDNESDAY	3				3 MID I EXAM	1
THURSDAY	4	1			4 MID I EXAM	2
FRIDAY	5	2 Good Friday			5 MID I EXAM	3 Project Expo (II, III, IV)
SATURDAY	6	3	1 MAY DAY		6 HOLIDAY	4 HOLIDAY
SUNDAY	7 HOLIDAY	4 HOLIDAY	2 HOLIDAY		7	5
MONDAY	8 Maharishi Dayanand Saraswati Jayanti	5 BABU JAGJEEVAN RAM JYANTHI	3		8	6
TUESDAY	9	6	4		9 SUBMISSION OF MID I MARKS	7
WEDNESDAY	10	7	5		10	8
THURSDAY	11 Maha Shivaratri/Shivaratri	8	6		11	9
FRIDAY	12	9	7 Project Review		12 Seminar (II Yr)	10 Design Contest (III Yr)
SATURDAY	13	10 Career Awareness (III Yr)	8 Project Review		13 HOLIDAY	11 HOLIDAY
SUNDAY	14 HOLIDAY	11 HOLIDAY	9 HOLIDAY		14	12
MONDAY	15	12	10		15	13
TUESDAY	16	13 UGADI	11		16	14
WEDNESDAY	17	14 DR AMBEDKAR JYANTHI	12		17	15
THURSDAY	18	15	13		18	16
FRIDAY	19	16	14 ID- UL FITR		19 Webinar (III Yr)	17 Workshop (IV Yr)
SATURDAY	20	17 Technical Seminar (IV Yr)	15 Technical Talk (III Yr)		20 HOLIDAY	18 HOLIDAY
SUNDAY	21 HOLIDAY	18 HOLIDAY	16 HOLIDAY		21	19
MONDAY	22 Commencement of Classes II,III,IV	19	17		22	20
TUESDAY	23	20	18		23	21 BAKRID
WEDNESDAY	24	21 RAMA NAVAMI	19		24	22
THURSDAY	25	22	20		25 Project Review	23
FRIDAY	26	23	21		26 Project Review	24 Workshop (II Yr)
SATURDAY	27 Guest Lecture (II Yr)	24 Quiz Contest (II Yr)	22 Poster Presentation (II, III Yr)		27 HOLIDAY	25 HOLIDAY
SUNDAY	28 HOLIDAY	25 HOLIDAY	23 HOLIDAY		28	26
MONDAY	29 Holi	26	24		29	27
TUESDAY	30	27	25		30	28 Project Review
WEDNESDAY	31	28	26			29 Project Review
THURSDAY		29	27			30
FRIDAY		30	28			31
SATURDAY			29 Workshop (IV Yr)			
SUNDAY			30 HOLIDAY			
MONDAY			31 MID I EXAM			

1	HOLIDAY
2	MID II EXAM
3	MID II EXAM
4	MID II EXAM
5	MID II EXAM
6	MID II EXAM
7	MID II EXAM
8	HOLIDAY
9	Practical Exam (II, III) Project Evaluation (IV)
10	Practical Exam (II, III) Project Evaluation (IV)
11	SUBMISSION OF MID II MARKS Practical Exam (II, III) Project Evaluation (IV)
12	Practical Exam (II, III) Project Evaluation (IV)
13	Practical Exam (II, III) Project Evaluation (IV)
14	Practical Exam (II, III) Project Evaluation (IV)
15	HOLIDAY
16	COMMENCEMENT OF END SEMESTER EXAM (II,III, IV Year)
17	
18	
19	MUHARRAM
20	END SEMESTER EXAM
21	
22	HOLIDAY
23	END SEMESTER EXAM (II,III, IV Year)
24	
25	
26	
27	
28	
29	HOLIDAY
30	JANMASHTAMI

VLSI Design

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

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(R18ECE3203) VLSI Design

Course Objectives:

The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

UNIT –I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds}-V_{ds} relationships, MOS transistor threshold Voltage, g_m, g_{ds}, Figure of merit ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 μm CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT –III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

UNIT -IV:

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, Contemporary Topics.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

	SRI INDU COLLEGE OF ENGG & TECH **LESSON PLAN** **(Regulation :R18)** **Department of Electronics and Communication Engineering**	**Prepared on** **Rev1:** **Page: 1 of 7**

Sub. Code & Title	**R18ECE3203 VLSI DESIGN**		
Academic Year: 2020-21	**Year/Sem./Section**	**III-II A,B,C,D**	
Faculty Name & Designation	**B.NEERAJA/PRATHYUSHA V**		

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT-I							
I	**Introduction**					**18**		
1.1	Introduction To IC Technology	T1, T3	1,1	5,5	Black board	03	22-03-2021 23-03-2021 24-03-2021	CO1, L2
1.2	MOS	T1	6	9	Black board	01	25-03-2021	CO1, L2
1.3	PMOS and NMOS	T1	9	13	Power point Presentation	02	26-03-2021 30-03-2021	CO1, L2
1.5	CMOS and BICMOS	T1	13	22	Black board	01	31-03-2021	CO1, L2
1.6	Basic Electrical Properties	T1	24	28	Black board	02	01-04-2021 02-04-2021	CO2, L4
1.7	MOS Transistor, Threshold voltage, Transconductance, output conductance, Figure of merit	T1	28	33	Black board	01	05-04-2021	CO2, L4
1.8	Pass transistor, NMOS Inverter	T1	33	40	Black board	01	06-04-2021	CO2, L4
1.9	Various pull ups	T1	40	42	Black board	03	07-04-2021 08-04-2021 15-04-2021	CO2, L4
1.10	CMOS Inverter analysis and design	T1	43	46	Black board	02	16-04-2021 31-03-2021	CO2, L4
1.11	BICMOS Inverter	T1	48	54	Black board	02	01-04-2021 06-04-2021	CO2, L4
	Review	**Signature of the HOD/Coordinator**						
Unit/ Item No.	**Topic (s)**	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	**Actual Date of Handled**	**CO/RBT**
	UNIT –II							
II	**VLSI Design Flow**					**14**		
2.1	VLSI Design Flow	R4	79	83	Black board Presentation	01	07-04-2021	CO3, L3

Sub. Code & Title	**R18ECE3203 VLSI DESIGN**		
Academic Year: 2020-21	**Year/Sem./Section**	**III-II A,B,C,D**	
Faculty Name & Designation	**B.NEERAJA/PRATHYUSHA V**		

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
2.2	MOS Layers	T1	55	56	Black board	01	08-04-2021	CO 3, L3
2.3	Stick Diagrams	T1,R4	56,109	65,116	Power point Presentation	04	15-04-2021 16-04-2021 19-04-2021 20-04-2021	CO 3, L3
2.2	Design rules and Layout	T1,R4	65,117	71,124	Power point Presentation	02	22-04-2021 23-04-2021	CO 3, L3
2.3	CMOS Design rules for wires, contacts and transistors	T1	71	74	Black board	02	24-04-2021 29-04-2021	CO 3, L3
2.4	Layout diagrams for NMOS and PMOS	T1	74	77	Black board	02	30-04-2021 03-05-2021	CO 3, L3
2.5	CMOS Inverters and Gates	T1	77	79	Black board	01	04-05-2021	CO 3, L3
2.6	Scaling of MOS Circuits	T1,R4	113,125	118,132	Black board	01	05-05-2021	CO 3, L3
	Review	**Signature of the HOD/Coordinator**						
UNIT- III								
III	**Gate Level Design**					**11**		
3.1	Logic gates and other complex gates	R4	135	147	Black board	02	06-05-2021 08-05-2021	CO4, L6
3.2	Switch Logic	T1, R3	135,157	137	Black board	01	10-05-2021	CO4, L6
3.3	Basic Circuit Concepts	T1	85-87		Black board	01	11-05-2021	CO4, L6
3.4	Alternate Gate Circuits	T1, T3, R3	145,175, 159	151,193, 163	Power point Presentation	02	12-05-2021 17-05-2021	CO4, L6
3.5	Time Delays	T1	93	98	Black board	02	18-05-2021 19-05-2021	CO4, L6
3.6	Driving large Capacitive Loads	T1	98	106	Black board	01	20-05-2021	CO4, L6
3.7	Wiring Capacitance	T1	106	107	Black board	01	21-05-2021	CO4, L6

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
3.8	Fan in, Fan out, Choice of Layers	T1,T2	108,283	110,289	Black board	01	24-05-2021	CO4, L6
	Review		**Signature of the HOD/Coordinator**					
	UNIT-IV							
IV	**Data path sub systems**					**16**		
4.1	**Sub system design**	R4	205	206	Black board	01	25-05-2021	CO5, L6
4.2	Shifters	R4,R3	229,349	231	Black board	02	26-05-2021 27-05-2021	CO5, L6
4.3	Adders	R4,R3	207,352	219	Black board	02	07-06-2021 08-06-2021	CO5, L6
4.4	ALUs	R4,R3	221,360	222	Black board	01	09-06-2021	CO5, L6
4.5	Multipliers	R4,R3	222,360	226	Power point Presentation	02	10-06-2021 11-06-2021	CO5, L6
4.7	Parity Generators, Comparators	T2	559		Black board	01	14-06-2021	CO5, L6
4.8	Zero/One Detectors, Counters	T2	559		Black board	01	15-06-2021	CO5, L6
4.9	SRAM	R4	232	238	Black board	02	16-06-2021 17-06-2021	CO5, L6
4.10	DRAM	R4	239	244	Black board	02	18-06-2021 21-06-2021	CO5, L6
4.11	ROM	T2	607	610	Black board	01	22-06-2021	CO5, L6
4.12	Serial access memories	T2	586	610	Black board	01	23-06-2021	CO5, L6
	Review	**Signature of the HOD/Coordinator**						
	UNIT-V							
V	Programmable Logic Devices:					**16**		
5.1	PLAs	R4	171	178	Black board	01	24-06-2021	CO6, L6
5.2	FPGAs	R4	190	201	Power point Presentation	01	25-06-2021	CO6, L6

5.3	CPLDs	R4	182	184	Power point Presentation	02	26-06-2021 28-06-2021	CO6, L6
5.4	Standard Cells	R4,T2	185,439	189	Black board	01	29-06-2021	CO6, L6
5.5	Programmable Array Logic	R4	178	179	Black board	01	30-06-2021	CO6, L6
5.6	Design Approach	R4	201	202	Black board	01	01-07-2021	CO6, L6
5.7	Parameters Influencing Low power Design	R4	333	340	Black board	02	02-07-2021 05-07-2021	CO6, L6
5.8	CMOS Testing	R4,T2	285,487	490	Black board	01	06-07-2021	CO6, L6
5.9	Need for Testing	R4	285	286	Black board	01	07-07-2021	CO6, L6
5.10	Test Principles	R4,T3	290,253	291,258	Black board	01	08-07-2021	CO6, L6
5.11	Design Strategies for Test	R4,T3	295,211	296,213	Black board	01	09-07-2021	CO6, L6
5.12	Chip Level Test Techniques	R4,T3	295	300	Black board	01	12-07-2021	CO6, L6
5.13	System Level Test Techniques	T2	522	526	Black board	01	13-07-2021	CO6, L6
5.14	Contemporary Topis: Issues in chip Design	T2	307	327	Black board	01	14-07-2021	CO6, L6
	Review	**Signature of the HOD/Coordinator**						

LIST OF TEXT BOOKS AND REFERENCES

TEXT BOOKS:

T1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
T2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
T3. VLSI Design – M. Michael Vai, 2001, CRC Press.

REFERENCE BOOKS:

R1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective Ming-BO Lin, CRC Press, 2011
R2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
R3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
R4. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
R5. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

WEB LINKS

W1. https://nptel.ac.in/courses/117103066/
W2. https://unacademy.com/lesson/electrical-properties-of-mos-circuits-1/A581F0R7
W3. www.egr.msu.edu/~mason/iucee/bog4/4-SNBhat_Stickdiagrams_IUCEEE.ppt
W4. https://www.mmumullana.org/downloads/files/n54744b57519b3.pdf
W5. https://www.elprocus.com/cmos-working-principle-and-applications/
W6. https://nptel.ac.in/courses/117101058/downloads/Lec-22.pdf
W7. https://www.d.umn.edu/~gshute/logic/barrel-shifter.xhtml
W8. https://www.slideshare.net/sabihasulthana9279/multipliers-in-vlsi
W9. https://pdfs.semanticscholar.org/.../0fd8b92dab2f6e08ed8210b05d43f94a5bb2.pdf
W10. https://sites.google.com/site/mazadzaveri/home/teaching/el512-vlsi-subsystem-design
W11. https://www.wikinote.org/Main/Savitribai-Phule-Pune-University/.../VLSI.../SPLDs/
W12. https://ece.duke.edu/~krish/teaching/Lectures/Testing.1.pdf
W13. https://www.svce.ac.in/departments/...VLSI%20DESIGN/EC2354%20Unit%204.pdf

CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1.	Recent topics from SIA Roadmap	To get knowledge	19-05-2021	Dr. N.C. Senthil kumar	PO5, PO6	PSO1,PSO2
2.	Nano Technology	To get knowledge	23-04-2021	P. Prashanth	PO6,PO10	PSO1,PSO2

ASSIGNMENT

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
I.	a) With neat sketches explain how NPN transistors are fabricated in bipolar process? b) Derive the expression for the threshold voltage of MOSFET?	CO1	T1,T3,R4	15-04-2021	20-04-2021
2.	a) Discuss in detail the NMOS design style? b) What are design rules? Why is metal-metal	CO1, CO4	T1,R4	15-04-2021	20-04-2021
3.	Describe three sources of wiring capacitors. Explain the effect of wiring capacitors on the performance of a VLSI circuit?	CO4	T1	15-04-2021	20-04-2021
4.	Describe layout diagram	CO4	T1, R4	15-04-2021	20-04-2021
5.	Explain about the principle and operation of FPGA. What are its applications?	CO5	R4	15-04-2021	20-04-2021
6.	a) Draw the circuit of 4-bit comparator and give its truth table. b) Explain the working of 4-Transistor S-RAM cell and give applications of RAM.	CO4	T2, R4	5-05-2021	13-05-2021

7.	Write short notes on the following i) Manchestercarrychain ii) Ripple carry-adder iii) Full Adder	CO5	R3, R4	5-05-2021	13-05-2021
8.	a) Explain about parameters which influence low power design. b) Differentiate between FPGAs and CPLDs.	CO6	R4	5-05-2021	13-05-2021
9.	a) Explain about modified Booth's algorithm. b) What are the applications of counters?	CO5	R3, R4, T2	5-05-2021	13-05-2021
10.	a) Explain the structure of programmable array logic to implement four inputs. b) Differentiate between PLA and PAL.	CO6	R4	5-05-2021	13-05-2021

SELF STUDY TOPICS

S.No.	Topics	Books & Journals	Course Outcomes
1	VLSI Design and VHDL Programming	"Advanced Digital Design with the Verilog HDL" by D Ciletti Micahel	CO2
2	System Design with FPGA	"FPGA-Based System Design" by Wolf	CO4

	SRI INDU COLLEGE OF ENGG & TECH **QUESTION BANK** **(Regulation :R18)** **Department of Electronics and Communication Engineering**	**(Regulation :R16)** **Prepared on** **Rev1:** **Page: 1 of 7**

Sub. Code & Title	**R18ECE3203 VLSI DESIGN**		
Academic Year: 2020-21	**Year/Sem.**	**III/II**	
Faculty Name & Designation	**B. NEERAJA/PRATHYUSHA.V**		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 6. Creating)

UNIT-1 Introduction			
	1 MARK QUESTIONS	**BT Level**	**Course Outcome**
1.	Define Moore's law and Integrated Circuit?	1	CO1
2.	List out the types of oxidations & explain?	1	CO1
3.	What are the advantages of IC technology?	1	CO1
4.	What is Ion Implementation & metallization?	1	CO1
5.	Define pass transistor?	1	CO1
6.	List out the advantages of Bi-CMOS Inverter? **(May 2018)**	4	CO2
7.	Define Figure of merit of MOS transistor (ω_0)?	1	CO2
8	What is saturation region and write its expression for I_{DS}?	1	CO2
9	What is non-saturation region and write its expression for I_{DS}?	1	CO2
10	Explain about system design cycle?	2	CO3
11	Define the terms: Lithography & Diffusion?	1	CO1
12	Interpret Transconductance (g_m) & Output conductance (g_{ds}) with expressions.	2	CO2
	10 MARKS QUESTIONS		
1.	Explain the NMOS fabrication process with neat sketch? **(April/May 2019)**	5	CO1
2.	a) Interpret CMOS fabrication using N-well process with neat diagrams. **(April/May 2018)** b) Determine the relationship between drain to source current versus drain to Source voltage (I_{DS}Vs V_{DS}) in non-saturated and saturated regions. **(April/May 2018)**	2,5	CO1,CO2
3.	Explain the NMOS Enhancement & depletion mode fabrication process with neat sketch. **(April/May 2017)**	2	CO1

4.	Illustrate the CMOS fabrication using P-well process with neat sketch. **(April/May 2018)**	2	CO1
5.	a) Compare CMOS, Bipolar and GaAs technology. (April/May 2017) **(April/May 2018)** b)Determine the pull-up to pull-down ratio of an NMOS inverter, driven through one or more pass transistors.	2,5	CO1,CO2
6.	Sketch and explain CMOS fabrication using Twin-Tub process?	3	CO1
7.	Find g_m and $r_{ds}$for an n-channel transistor with v_{GS}=1.2V, v_{tn}=0.8v, W/L=10, $\mu_n C_{ox}$=92μA/V^2 and V_{DS}=V_{ef}+ 0.5v. The output impedance constant (λ) =95.3*$10^{-3}$$v^{-1}$?	1	CO2
8	a) Illustrate dry and wet oxidation with neat diagrams. b) Explain the alternative forms of pull-ups.	2,1	CO1,CO2
9	Assume PMOS transistor is operated in the triode region with following parameters: v_{tp}= -1v and W/L=95, v_{GS}= -4.5V and V_{DS}=-2.2v, $\mu_p c_{ox}$=95μA/V^2. Find I_{DS}& R_{DS}.	4	CO2
10	a) Interpret the operation of Bi-CMOS inverter and specify its characteristics. b) Illustrate the characteristics of NMOS inverter with neat diagram **(April/May 2017)**	2,2	CO1,CO2
11	a) What is BiCMOS Technology & list advantages over CMOS technology. b) Determine the pull-up to pull-down ratio of an NMOS inverter, driven by another NMOS transistor	1,5	CO1,CO2
	Unit -II : VLSI Circuit Design Processes		
	1 MARK QUESTIONS		
1	What are the steps to be followed in designing VLSI chip?	1	CO3
2	Sketch a stick diagram for 2 input NMOS NAND gate? **(May 2019)**	3	CO3
3	Define layout?	1	CO3
4	List out the MOS layers?	1	CO3
5	Sketch a stick diagram for 2 input NMOS EX-OR gate **(May 2019)**	3	CO3
6	Design a stick diagram for NMOS logic $Y=(A+B+C)^1$?	6	CO3
7	Explain models of scaling?	2	CO3
8	What is stick diagram? **(May 2019)**	1	CO3
9	List out any six scaling parameters?	1	CO3

10	Design a stick diagram for 2 input NMOS NOR gate?	6	CO3
	10 MARKS QUESTIONS		
1	Illustrate the VLSI Design flow &write clearly about design processes? **(April/May 2018)**	2	CO3
2.	Explain the guidelines & design rules for stick diagram and layout diagram? **(April/May-2017)**	2	CO3
3.	a)Design the stick diagram for two input NMOS NAND and NOR gates b)Compare the CMOS design style with NMOS design style?	6,2	CO3
4.	Sketch the stick diagram& layout for two input NMOS Ex-OR gates?	3	CO3
5.	a)Design the stick diagram for two input PMOS NAND and NOR Gates? b)List out the limitations of scaling? **(May 2018)**	6,4	CO3
6.	Outline the layout diagram for NMOS inverter?	2	CO3
7.	Interpret the merits & demerits of scaling? **(May 2018)**	2	CO3
8	Explain about design rules for wires in detail (orbit 2µm CMOS)? **(April/May 2018)**	5	CO3
9	Illustrate the scaling factors for different types of device parameters? **(May 2019)**	2	CO3
10	Design the circuit diagram, stick diagram & layout for given Boolean function using CMOS.F=$(A+B+C)^1$? **(May 2019)**	6	CO3
	Unit -III : Gate Level Design		
	1 MARK QUESTIONS		
1.	Define switch logic? **(April/May 2017)**	1	CO4
2.	What is sheet resistance (R_S)?	1	CO4
3	Define pass transistor? **(May 2019)**	1	CO4

4	Explain transmission gates?	2	CO4
5	List out the types of alternative gate circuits. **(April/May 2017)**	1	CO4
6	What is propagation delay?	1	CO4
7	Illustrate wiring capacitance? **(May 2018)**	2	CO4
8	Define Fan-in and Fan-out? **(April/May 2017) (May 2018)**	1	CO4
9	Explain Rise time(t_r) & Fall time (t_f) ?	2	CO4
10	What is gate capacitance (C_g) ?	1	CO4
	10 MARKS QUESTIONS		
1.	Interpret the operation of a CMOS Inverter with sketches?	2	CO4
2	a)Explain the working of complex gates with neat diagrams? b)Determine the constructional features & performance characteristics of PSEUDO NMOS logic? **(May 2018)**	5,5	CO4
3.	Sketch the logic diagram of dynamic and domino CMOS logic and explain in detail? **(May 2019)**	3	CO4
4	Illustrate the C^2MOS and n-p-MOS logic with neat diagrams?	2	CO4
5.	a) Explain about the propagation delay in a cascaded pass transistor? b) Discuss fan in & fan out characteristics of different CMOS design?	2,6	CO4
6	Identify the problem of driving large capacitive loads? Explain a method to drive such load? **(May 2019)**	3	CO4
7.	Outline the constraints of choice of layers? **(May 2018)**	2	CO4

8.	Illustrate the sources of wiring capacitances& Tell about the performance of VLSI Circuits? **(May 2018)**	2	CO4
9.	Categorize different series & parallel combinations of pull up &pull down networks?	4	CO4
10.	Interpret the features of wiring capacitance? Explain in detail about the Gate level design.? **(May 2018)**	2	CO4
11	Solve equation for propagation delay in pass transistor chain?	3	CO4
Unit-IV : Data Path Subsystems			
1 MARK QUESTIONS			
1.	What is a shifter & list out its types?	1	CO5
2.	Explain serial adder?	1	CO5
3.	What is one/zero detectors? **(May 2018)**	1	CO5
4.	Explain a counter? **(May 2018)**	1	CO5
5.	What is data path subsystem?	1	CO5
6.	What is memory array subsystem?	1	CO5
7.	Define DRAM? How it differs from SRAM?	1	CO5
8	Illustrate construction & various operation with DRAM?	2	CO5
9	Define FLASH EPROM?	1	CO5
10	Classify memories?	2	CO5
10 MARKS QUESTIONS			
1.	Make use of the circuit diagram for 4x4 barrel shifter using complementary transmission gates & explain its shifting operation. **(April/May 2017)**	3	CO5
2.	Outline & explicate the structure of carry look ahead adder.	2	CO5
3.	a)Explain n- bit parallel adder? **(April/May 2017)** b) Explain the principle of SRAM with neat sketch? **(April/May 2017)**	5,5	CO5
4.	Discuss the following. a)Shifter **(April/May 2017)**b) Parity generator **(April/May 2017) (May 2018)**	6	CO5

5.	a) Design a magnitude comparator based on the data path operators and what is magnitude comparator b)Illustrate basic memory chip architecture?	6,2	CO5
6.	a) Show the logic diagram of zero/one detector & explicate its operation with help of diagram. **(May 2018)** b)What is the principle of DRAM using 1- transistor with neat diagram?	2, 1	CO5
7.	Discuss about data path organization & serial adder.	6	CO5
8	a) Sketch & explain the asynchronous counter in detail. b)Explain about CAM.	3,2	CO5
9	a)Illustrate synchronous up/down counter using adder & register with neat diagram. b) Interpret shift registers & their types. **(May 2019)**	2,2	CO5
10	a) Classify multipliers in detail . **(May 2018) (May 2019)** b)Categorize types of sequential memory access.	4,4	CO5
	Unit-V: Programmable Logic Devices, CMOS Testing		
	1 MARK QUESTIONS		
1.	What is semi-custom ASIC?	1	CO6
2.	Define is full-custom ASIC?	1	CO6
3.	What is Testing? **(April/May 2017)**	1	CO6
4.	Explain an ASIC?	2	CO6
5.	Contrast channeled & channel less gate arrays.	4	CO6
6.	Compare types of PLD's.	5	CO6
7.	Distinguish Open and Short circuit fault.	4	CO6
8.	What is BIST& mention its advantages.	1	CO6
9.	Define manufacturing testing?	1	CO6
10.	Explain functionality testing?	2	CO6
11.	What is JTAG?	1	CO6
12.	Define Fault coverage?	1	
	10 MARKS QUESTIONS		
1.	Compare the following in detail with neat diagram	4	CO6

	i. Channeled Gate array ii. Channel less Gate array iii. Structured Gate array		
2.	a) Make use of schematic structure of PLA & explain its principle. b)DesignJK flip flop circuitUsing PLA. **(May 2019)**	3,6	CO6
3.	Sketch a diagram for two input XOR gate using PLA & explain its operation with the help of truth tables **(May 2019)**	3	CO6
4	Build the structure of PAL& explain its principle. **(May 2019)**	6	CO6
5.	Design JK flip flop using PROM.	6	CO6
6.	a) Elaborate the principle & operation of FPGA **(May 2018)** b) List out the applications of FPGA**. (May 2018)**	6,1	CO6
7.	a) Outline the basic structure of Complex Programmable Logic Device and Explain? b) List out the applications and advantages of CPLD. **(May 2018)**	2,1	CO6
8	a)Compare PLA's, PAL's, CPLD's, FPGA's, & standard cells. **(May 2019)** b)Illustrate the following i. Observability ii. Fault Coverage iii. Fault Simulation iv. Controllability	4,2	CO6
9	Categorize various system level test techniques & Explain the layout design for improved testability. **(May 2018)**	4	CO6
10	a) Model high level design flow of an ASIC. b) Illustrate the following i. Stuck- at faults ii. Stuck- open & stuck- short faults iii. Stuck- open fault.	3,2	CO6
11	a)Identify the design strategies for test(DST). **(May 2018)** b) Explain the scan-based test techniques.	3,2	CO6
12.	a)Outline and explain about the internal structure of BIST **(May 2018)** b)Construct the architecture and the state diagram of TAP controller.	2,6	CO6

BR-16 **D4**

Subject Code: R16ECE1115

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech - II Semester –End Examinations (Regular) May - 2019

VLSI DESIGN - (Electronics & Communication Engineering)

Duration: 3 Hrs **09.05.2019** **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5Qx4M = 20M**

1. Compare CMOS and Bipolar technologies.
2. Design the stick diagram for two input CMOS NOR gate.
3. What are the effects which can result in incorrect functioning of a Gate?
4. What are the applications of ROM?
5. Draw the basic structure of CPLD.

Section – B

Answer any *FIVE* questions choosing at least one from each Unit **Marks: 5Qx10M = 50M**

UNIT - I

6. a) Draw NMOS transistor characteristics in enhancement mode.
   b) Derive the expression for MOS transistor trans conductance (g_m) and output conductance (g_{ds})

(OR)

7. a) Explain the process of fabrication of NMOS Transistor in NMOS Technology.
   b) What is pass transistor and give its symbol.

UNIT - II

8. a) Draw the Layout diagram of CMOS three input NAND gate.
   b) Explain briefly about scaling of MOS circuits.

(OR)

9. a) Draw the Layout diagram of CMOS three input NOR gate.
   b) Draw the stick diagram of NMOS inverter.

UNIT - III

10. a) Give the circuit and operation of Domino logic OR gate.
    b) Draw the structure and give principle of DCVSL gate.

(OR)

11. a) Explain how to drive large capacitive loads.
    b) What is cross talk?

UNIT - IV

12. a) Explain 4-bit barrel shift register.
    b) Explain Booth multiplier.

(OR)

13. a) Draw the circuit of 4-bit comparator and give its truth table.
    b) Explain the working of 4-Transistor S-RAM cell and give applications of RAM.

UNIT - V

14. a) Explain about parameters which influence low power design.
    b) Differentiate between FPGAs and CPLDs.

(OR)

15. a) Explain the structure of programmable array logic to implement four inputs. .
    b) Differentiate between PLA and PAL.

BR-14 **D4**

Subject Code: R14ECE1115

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech - II Semester –End Examinations (Regular/Suppl.) May - 2018

VLSI DESIGN

(Electronics & Communication Engineering)

Duration: 3 Hrs **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5Qx4M = 20M**

1. Draw the circuit of BiCmos inverter.
2. Draw the stick diagram of CMOS inverter.
3. Define Fan in and Fanout and mention the effect of capacitance on Fanout.
4. Draw the circuit and give working of DRAM cell.
5. Draw the basic structure of FPGA.

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

6. a) Derive the expression for drain current of MOS transistor in linear region.
   b) Give the expression used for evaluating the threshold voltage of MOS transistor.

(OR)

7. a) Explain CMOS P-Well process steps.
   b) What are the main differences between CMOS and BiCMOS technologies?

UNIT - II

8. a) Explain various steps in VLSI design flow with the help of flow chart.
   b) What are the various MOS layers used in Layouts?

(OR)

9. a) Draw the Layout diagram of NMOS inverter.
   b) Explain about design rules for wires and contacts of NMOS and CMOS.

UNIT - III

10. a) Give the circuit and operation of pseudo NMOS NOR gate.
    b) Draw the circuit of DCVSL gate to implement the output $(A+BC)^1$ and $(A'.B') + (A'.C')$.

(OR)

11. a) What are the constraints which can be considered in choice of Layers.
    b) Explain about wiring capacitance and time delays.

P.T.O

UNIT - IV

12. a) Explain about modified Booth's algorithm.
    b) What are the applications of counters?

(OR)

13. a) Draw the circuit of 8-bit parity generator using Logic gates and give its principle.
    b) Design zero/one detector.

UNIT-V

14. a) Mention the need for testing and discuss about design strategies for test.
    b) What are the applications of FPGAs?

(OR)

15. a) Explain about chip level test techniques.
    b) What are the applications of CPLDs?

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BR-14 **D4**

Subject Code: R14ECE1115

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech - II Semester –End Examinations (Regular) April/May - 2017

VLSI DESIGN

(Electronics & Communication Engineering)

Duration: 3 Hrs **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5x4 = 20M**

1. Compare CMOS and Bipolar technologies.
2. Draw the circuit diagram for two-input NAND.
3. Define Fan-in and Fan-out.
4. What is testing? Explain.
5. Explain charge storage.

Section – B

Answer any *FIVE* of the following questions **Marks: 5x10 = 50M**

UNIT - I

6. a) Derive the expression for the threshold voltage of MOSFET.
   b) Explain the MOS transistor operation with the help of neat sketches in the Depletion mode.

(OR)

7. a) Explain different steps involved in IC fabrication.
   b) Draw the circuit for nMOS inverter and explain its operation and characteristics.

UNIT - II

8. a) What are the different types of design rules? Explain.
   b) What is stick diagram? Draw the stick diagram and layout for a CMOS inverter.

(OR)

9. a) Explain briefly about sheet resistance.
   b) Discuss the limits due to subthreshold current.

UNIT – III

10. a) Explain the design of a 4-bit shifter.
    b) Discuss the general arrangement of a 4-bit arithmetic process.

(OR)

11. a) Explain two phase clocking.
    b) Discuss some design considerations.

UNIT - IV

12. a) Explain the structured design approach of parity generator.
    b) Explain switch logic.

(OR)

13. a) Explicate n- bit parallel adder.
    b) Explicate the principle of SRAM with neat sketch.

UNIT-V

14. a) Give the overflow of system on chip designs.
    b) Explain the FPGA design flow.

(OR)

15. Explain stack implementation using VHDL.

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

III B.Tech - II Semester - I Mid Term Examinations, February - 2020

(R16ECE1115) VLSI DESIGN (Electronics and Communication Engineering)

Duration: 90Mins **Dt: 04.02.2020 AN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. List out the advantages of Bi-CMOS Inverter.
2. Define Figure of merit of MOS transistor (ω_0).
3. Sketch a stick diagram for 2 input NMOS EX-OR gate.
4. List out any six scaling parameters.
5. Define pass transistor.

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. a) Interpret CMOS fabrication using N-well process with neat diagrams.
   b) Determine the relationship between drain to source current versus drain to Source voltage (I_{DS}Vs V_{DS}) in non-saturated and saturated regions.
7. a) Compare CMOS, Bipolar and GaAs technology.
   b) Determine the pull-up to pull-down ratio of an NMOS inverter, driven through one or more pass transistors.
8. Sketch the stick diagram & layout for two input NMOS Ex-OR gates.
9. Design the circuit diagram,stick diagram & lay out for given Boolean function using CMOS.$F=(A+B+C)^1$.
10. Interpret the operation of a CMOS Inverter with sketches.
11. Illustrate the C^2MOS and n-p-MOS logic with neat diagrams.

BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - II Semester - I Mid Term Examinations

(R16ECE1115) VLSI DESIGN - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 15.02.2019 AN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. What is pass transistor?
2. List out the advantages of Bi-CMOS Inverter.
3. List out the MOS layers.
4. Design a stick diagram for 2 input NMOS EX-OR gate.
5. What are transmission gates?

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. Describe the CMOS fabrication using P-well process with neat sketch.
7. a) Write the comparision between CMOS, Bipolar and GaAs technology.
   b) Determine the pull-up to pull-down ratio of an NMOS inverter, driven through one or more Pass transistors.
8. a) Design the stick diagram for two input NMOS NAND and NOR gates.
   b) Compare the CMOS design style with NMOS design style.
9. Design the circuit diagram, stick diagram and lay out for given Boolean function using CMOS. $F=(A+B+C)^1$
10. Draw the logic diagram of dynamic and domino CMOS logic and explain in detail.
11. Elucidate briefly C^2MOS and n-p-MOS logic with neat diagrams.

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - II Semester - II Mid Term Examinations

(R16ECE1115) VLSI DESIGN - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 16.04.2019 AN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. What is gate capacitance (C_g)?
2. Define FLASH EPROM.
3. Classify memories.
4. What is programmable ASIC?
5. Explain an ASIC.

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. Identify the problem of driving large capacitive loads? Explain a method to drive such load.
7. Interpret the features of wiring capacitance? Explain in detail about the Gate level design.
8. a) Show the logic diagram of zero/one detector and explicate its operation with help of diagram.
   b) What is the principle of DRAM using 1- transistor with neat diagram?
9. a) Classify multipliers in detail.
   b) Categorize types of sequential memory access.
10. a) Make use of schematic structure of PLA and explain its principle.
    b) Design JK flip flop circuit Using PLA.
11. a) Outline the basic structure of Complex Programmable Logic Device and explain.
    b) List out the applications and advantages of CPLD.

***

BR-14 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - II Semester - I Mid Term Examinations

(R14ECE1115) VLSI DESIGN

(Electronics & Communication Engineering)

Duration: 90Mins **Date: 24.01.2017 AN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5x1 = 5M**

1. List out the types of oxidations and explain.
2. Define Figure of merit of MOS transistor (ω_0).
3. Mention any few λ based design rules for transistors.
4. List out any six scaling parameters.
5. List out the types of alternative gate circuits.

Section – B

Answer any *FOUR* questions **Marks: 4x5 = 20M**

6. Explicate the NMOS Enhancement and depletion mode fabrication process with neat sketch.
7. a) Elucidate the operation of Bi-CMOS inverter and specify its characteristics.
   b) Write the characteristics of NMOS inverter with neat diagram.
8. Elucidate the VLSI Design flow and write clearly about design processes.
9. Draw the layout diagram for NMOS inverter.
10. Write the operation of a CMOS Inverter with sketches.
11. a) Explicate the working of complex gates with neat diagrams.
    b) Describe the constructional features and performance characteristics of PSEUDO NMOS logic.

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BR-14 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - II Semester - II Mid Term Examinations

(R14ECE1115) VLSI DESIGN

(Electronics & Communication Engineering)

Duration: 90Mins **Date: 31.03.2017 AN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5x1 = 5M**

1. What is gate capacitance (C_g)?
2. What is a shifter and list out its types?
3. What is FLASH EPROM?
4. What is BISTand mention its advantages?
5. What is manufacturing testing?

Section – B

Answer any *FOUR* questions **Marks: 4x5 = 20M**

6. What are the features of wiring capacitance? Write in detail about the Gate level design.
7. Derive an equation for propagation delay in pass transistor chain.
8. a) Draw and explicate the asynchronous counter in detail.
   b) Write in detail about CAM.
9. a) Give the classifications of multipliers and write in detail.
   b) Write the different types of sequential memory access.
10. a)Write about Complex Programmable Logic Device. And draw its basic structure.
    b) Give the applications and advantages of CPLD.
11. a) Compare PLA's, PAL's, CPLD's, FPGA's, and standard cells.
    b) Illustrate the following i) Observability ii) Fault Coverage iii) Fault Simulation iv) Controllability.

***

ANTENNAS AND WAVE PROPAGATION

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

L	T	P	C
3	1	0	3

(R18ECE3201) Antennas and Wave Propagation

Course Objectives:

The main objectives are:

- Understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
- Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time filed.
- Aware of the wave spectrum and respective band based antenna usage and also to know the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

UNIT -I:

Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front-to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

UNIT -II:

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT -III:

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics, Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types-Related Features, Illustrative Problems.

Lens Antennas: Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications.

UNIT -IV:

Antenna Arrays: Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

Antenna Measurements: Introduction, Concepts – Reciprocity, Near and Far Fields, Coordinate Systems, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods)

UNIT -V:

Wave Propagation – I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric propagation.

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

	SRI INDU COLLEGE OF ENGG & TECH **LESSON PLAN** **(Regulation: R18)** **Department of Electronics and Communication Engineering**	**Prepared on** **Rev1:** **Page: 1 of 6**

Sub. Code & Title	**R18ECE3201 ANTENNAS AND WAVE PROPAGATION**		
Academic Year: 2020-21		**Year/Sem./Section**	**III-II A,B,C,D**
Faculty Name & Designation	**SANDHYA BOLLA/P.MAMATHA**		

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Proposed Date of Handled	CO/RBT
	UNIT-1							
I	**Antenna Basics:**					**15**		
1.1	Introduction,	T1, R2	8,529	9,530	Black board	01	22-03-2021	CO-1, L2
1.2	Basic Antenna Parameters	T1, R2	9,530	31,596	Black board	01	23-03-2021	CO-2, L2
1.3	Fields from Oscillating Dipole,	T1	31	33	Black board	01	24-03-2021	CO-3, L3
1.5	Field Zones, Front-to-back Ratio,	T1, R2	45,556	47,572	Black board	01	25-03-2021	CO-3, L3
1.6	Antenna Theorems, Radiation,	T1, R2	70,298	73,302	Black board	01	26-03-2021 30-03-2021	CO-2, L2
1.7	**Thin Linear Wire Antennas**	T1, R1	157,133	169,134	Black board	01	31-03-2021	CO-2, L2
1.8	– Radiation from Small Electric Dipole,	T1, R1	171,143	173,150	White board	01	01-04-2021 02-04-2021 05-04-2021	CO-3, L3
1.9	Quarter Wave Monopole and HalfWaveDipole–CurrentDistributions,	T1, R1	173,163	176,164	Presentation	01	06-04-2021 07-04-2021 08-04-2021	CO-3, L3
1.10	FieldComponents,RadiatedPower,RadiationResistance,	T1, R1	169,113	171,140	Presentation	01	15-04-2021	CO-3, L3
1.11	Beam Width, Directivity,	T1, R1	18,62	19,39	Presentation	01	16-04-2021	CO-2, L2
1.12	Effective Area and Effective Height,	T2, R1	377,879	378,884	Presentation	01	08-04-2021	CO-2, L2
1.13	Natural Current Distributions,	R1	151	152	Black board	01	15-04-2021	CO-3, L3
1.14	Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths,	R1	152	170	Presentation	01	19-04-2021 20-04-2021	CO-3, L4
1.15	Illustrative Problems.	R1	196	197	Presentation	01	22-04-2021	CO-3, L3
1.16	Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole,	R1	206	239	Presentation	01	23-04-2021 24-04-2021	CO-3, L4
	Review	**Signature of the HOD/Coordinator**						
	UNIT –II							
II	**VHF, UHF and Microwave Antennas-I:**					**8**		
2.1	ArrayswithParasiticElements,Yagi-UdaArray,	T1, R2	320,777	321,781	Demonstration	02	29-04-2021	CO-4, L2
2.2	Folded Dipoles and their Characteristics,	R1, R2	458,773	462,777	Charts	01	30-04-2021	CO-4, L2
2.3	Helical Antennas – Helical Geometry,	T1, R2	297,791	298,792	Charts	01	03-05-2021 04-05-2021	CO-4, L2
2.4	Helix Modes, Practical DesignConsiderationsforMonofilarHelicalAntennainAxialandNormalModes,	T1, R2	303,792	317,796	Demonstration	01	05-05-2021 06-05-2021	CO-4, L2
2.5	HornAntennas– Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns,	T1, R2	55,797	56,799	Black board	02	08-05-2021 10-05-2021	CO-4, L4

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Proposed Date of Handled	CO/RBT
2.6	Illustrative Problems.	R2	800	803	Black board	01	11-05-2021 12-05-2021	CO-4, L4
	Review	**Signature of the HOD/Coordinator**						
	UNIT- III							
III	**VHF, UHF and Microwave Antennas - II:**					**10**		
3.1	Micro strip Antennas – Introduction, Features,	T1, R2	500,809	510,810	Black board	01	17-05-2021	CO-4, L2
3.2	AdvantagesandLimitations,	R1	722	726	Black board	01	18-05-2021 19-05-2021	CO-4, L2
3.3	RectangularPatchAntennas–GeometryandParameters,Characteristics of Micro strip Antennas.	T1, R1	503,727	517,730	Black board	01	20-05-2021 21-05-2021	CO-4, L4
3.4	Impact of Different Parameters on Characteristics, Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors,	T1, R1	369,785	382,794	Black board	01	24-05-2021 25-5-2021	CO-4, L4
3.5	Paraboloidal Reflectors – Geometry, Pattern Characteristics,FeedMethods,ReflectorTypes-RelatedFeatures,	T1, R1	383,794	396,806	Black board	01	26-05-2021	CO-4, L4
3.6	IllustrativeProblems.	T1, R1	377,835	378,838	Black board	01	27-05-2021	CO-4, L3
3.7	**Lens Antennas:**							
3.8	Introduction,	T1, R2	399,839	400,840	Black board	01	07-06-2021	CO-4, L2
3.9	Geometry of Non-metallic Dielectric Lenses,	T1, R2	400,840	412,842	Black board	01	08-06-2021 09-06-2021	CO-4, L3
3.10	Zoning, Tolerances,	T1	412	415	Black board	01	10-06-2021	CO-4, L4
3.11	Applications.	R2	842	843	Black board	01	11-06-2021	CO-4, L4
	Review	**Signature of the HOD/Coordinator**						
	UNIT-IV							
IV	**Antenna Arrays**					**15**		
4.1	Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases,	T1, R3	100,294	107,297	Presentation	01	14-06-2021	CO-4, L3
4.2	Principle of Pattern Multiplication,	T2, R2	365,611	369,614	Presentation	02	15,16 JUNE 2021	CO-4, L2
4.3	Uniform Linear Arrays – Broadside Arrays,	T2, R3	125,298	127,302	Black board	02	17 JUNE 2021	CO-4, L4

4.4	Endfire Arrays, EFA with increased Directivity, Derivation of their Characteristics and Comparison,	R2, R3	620,312	632,314	Black board	02	18,19TH JUNE 2021	CO-4, L4
4.5	BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays,	T2, R2	372,635	378,637	Presentation	02	21,22ND JUNE 2021	CO-4, L4
4.7	Illustrative Problems.	T2, R2	394,654	396,678	Presentation	02	23,24TH JUNE 2021	CO-4, L3
4.8	**Antenna Measurements:**	T1, R1	715,839	717,740	Black board	01	25TH UNE 2021	
4.9	Introduction, Concepts – Reciprocity, Near and Far Fields, Coordinate Systems,	T1, R1	717,852	738,865	Black board	02	26TH,28TH JUNE 2021	CO-4, L2
4.10	Directivity Measurement,GainMeasurements(byComparison,Absoluteand3-AntennaMethods)	T1, R1	738,865	741,872	Back board	01	29TH ,30TH JUNE 2021	CO-6, L6
	Review	**Signature of the HOD/Coordinator**						
	UNIT-V							
V	Wave Propagation – I:					**12**		
5.1	Introduction, Definitions,	T1, R2	771,1102	775,1104	Presentation	01	01 JULY2021	CO-5, L2,
5.2	Categorizations and General Classifications, DifferentModesofWavePropagation,	**T1, R2**	725,1107	779,1110	Presentation	01	02 JULY 2021	CO-5, L2
5.3	Ray/ModeConcepts,GroundWavePropagation(Qualitative Treatment) – Introduction,	T1, R2	780,110	786,114	Black board	02	5th, 6th july 2021	CO-5, L2
5.4	Plane Earth Reflections, Space and Surface Waves, Wave Tilt,	T1, R3	783,436	790,438	Black board	01	7th,8th,9th july 2021	CO-5, L3
5.5	Curved Earth Reflections. Space Wave Propagation –	T1, R3	794,438	797,442	Black board	01	12th july2021	CO-5, L4
5.6	Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature,	T1, R3	800,442	804,445	Presentation	01	13,14th july 2021	CO-5, L3
5.7	Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphererepropagation.	T1, R3	804,463	813,476	Black board	01	15,16th july 2021	CO-6, L2
5.8	**Wave Propagation – II:**				Presentation	01	17th july2021	
5.9	Sky Wave Propagation – Introduction, Structure of Ionosphere,	T1, R3	815,446	817,448	Presentation	01	19th july2021	CO-6, L2
5.10	Refraction and Reflection of Sky Waves by Ionosphere, Ray Path,	T1, R3	817,448	822,450	Presentation	01	20th july2021	CO-5, L2

5.11	Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance,	T1	824	832	Presentation	01	22nd july 2021	CO-6, L3
5.12	Relation between MUF and Skip Distance, Multi-hop Propagation.	R2	1136	1155	Presentation	01	23rd july 2021	CO-6, L3
	Review	**Signature of the HOD/Coordinator**						

LIST OF TEXT BOOKS AND REFERENCES

Text Books:

T1 . Antennas and Wave Propagation–J.D.Kraus, R.J.Marhefka and Ahmad S.Khan, TMH, New Delhi,4thed.,(Special Indian Edition), 2010

T2 Electromagnetic Waves and Radiating Systems– .C. Jordan and K.G.Balmain,PHI,2nd ed., 2000

Reference Books:

R1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.

R2 . Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi,2001.

R3. Transmission and Propagation–E**R-5**.V.D.Glazier and H.R.L. Lamont, The Services Text Book of Radio,vol.5,Standard Publishers Distributors, Delhi.

R4. Electronic and Radio Engineering–F.E.Terman, McGraw-Hill,4thEdition,1955.

R5. Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

Web References

W1. www.msk1986.files.wordpress.com/2013/09/7ec1_antenna

W2. www.books.google.com/books

W3. www.ccs.neu.edu/.../S10/Lectures/AntennasPropagation.pdf

W4 .www.ieeexplore.ieee.org

W5. www.darshan.ac.in/DIETDS/EC/276/antenna-wave-propagation

W6 www.smartzworld.com/.../antenna-wave-propagation-awp

W7. www.nptel.ac.in/syllabus

W8. www.ieeeaps.org/publications/ieee-transactions

W9. www.researchgate.net/publication/284284255_Near

W10. www.radio-electronics.com/info/antennas

CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1.	Slot antennas	PPTS	19-05-2021	Dr. P.Mukunthan	10	3
2.	Non-Resonant antenna	PPTS	23-04-2021	Dr. Suresh	10	1

ASSIGNMENT

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1.	(1) Define the following terms: (i) Radiation Intensity (ii) Antenna Temperature (iii) Effective aperture (iv)Antenna field zones (v) Effective height (vi) Gain, Directivity (vii) FNBW,HPBW (viii)Derive the expressions for electric and magnetic field radiated by the half wave dipole antenna and short electric dipole?	1 and 3	T1,R2	24-05-2021	28-05-2021
2.	1. (a)Draw the neat diagram of 2-wire and 3-wire folded dipole? (b) What are the modes of helical antenna? Write in detail with neat sketches and equations?	1 and 4	T1,R2	24-05-2021	28-05-2021
3	What are the characteristics of MSA? (a) What are the different types of Reflector antennas with neat diagrams? (b) Explain about Dielectric lenses?	2 and 4	T1,R2	22-07-2021	27-07-2021
4	Derive maxima ,minima and half power point directions for EFA? (b).A uniform	3 and 5	T1,R2	22-07-2021	27-07-2021

	linear array consists of 16 isotropic point sources with a spacing of □/4.Draw the field pattern using pattern multiplication?				
5	Write in detail (a) effects of Earth curvature (b) Absorption (c) Scattering (d) Tropospheric propagation (e) Multi-hop propagation (f) M-curves and its characteristics (g)Duct propagation, skip distance,wave tilt (h) MUF, virtual height, critical frequency	2	T1,R1	22-07-2021	27-07-2021

SELF STUDY TOPICS

S.No.	Topics	Books & Journals	Course Outcomes
1	MIMO	MIMO WIRELESS COMMUNICATION BY BIGLIERI	CO2
2	ULTRA WIDEBAND ANTENNAS (UWB)	Multifunctional Ultrawideband Antennas: Trends, Techniques and Applications BY CHINMOY SAHA	CO4

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 5. Creating)

UNIT-1 Antenna Basics:			
	1 MARK QUESTIONS	**BT Level**	**Course Outcome**
1.	If the diameter of the antenna is 2λ, estimate far field distance? **(R18 May – 2019)**	2	CO1
2.	If beam solid angle is π ste radians, Calculate directivity in dB? **(R16 NOV/DEC– 2018)**	2	CO1
3.	Explain the different types of patterns in antennas? (**R16 March 2021**	2	**CO1**
4..	Compare Beam Width & Beam Efficiency?	4	CO1
5.	Determine the Rr for half wave dipole?	5	CO1
6.	Explain the Maxwell's equations?	2	CO1
7.	List out the applications of loop antenna?	4	CO1
8	Explain dual characteristics of an antenna? (**R16Ocober/Nov 2020)**	2	CO1
9	Show the expression floor front to back ratio?	2	CO1
10	Classify the antenna field zones	2	CO1
	10 MARKS QUESTIONS		
1.	a) Draw the equivalent circuit of an antenna and explain about Antenna impedance. b) Define directivity and gain. (**R18 May – 2019)**	2	CO1
2.	Derive the EM fields at observation point due to half-wave antenna? (**R18 May – 2019)**	3	CO1
3.	a) Find the Rrad of Infinitesimal dipole whose overall length is l=λ/50. b) Find the radiation resistance of a loop antenna of diameter 0.5m operating at 1MHz? **(R16 NOV/DEC– 2018)**	2	CO1

4.	a) The radiation intensity is represented by U = $U_0 \sin(\pi \sin\theta)$, $0 \le \theta \le \pi/2$ and 0 elsewhere Find exact directivity. b)The maximum gain of a horn antenna is +20 dB, While the gain of its first side lobe is -15dB. What is the difference in gain between the maximum and first sidelobe in dB. **(R16 NOV/DEC– 2018)**	3	CO1
5.	Explain the following: (i) Radiation Intensity (ii) Antenna Temperature (iii) Effective aperture, Effective length, Directivity, Beam width, Beam Area? Evaluate the expression for radiation resistance of half wave dipole? **R16 October/Nov 2020 , R16 March2021**	2	CO1
6.	Explain about the radiation from small electric dipole? (**R16March2021)**	2	CO1
7.	Evaluate the expression for radiation resistance of short electric dipole (**R16March2021)**	5	CO1
8	Write the equations for electric and magnetic field components of short electric dipole in Quasi stationary case? (b)Discuss Helmholtz theorem	1	CO1
9	Define effective height and directivity-gain resolution. (b) Compare small loop antenna with short dipole.	4	CO1
10	Solve the expression for electric and magnetic field radiated by the half wave dipole antenna	3	CO1
11	Explain about Retarded Potentials?	2	CO1
12	Explain Antenna theorems (Reciprocity & Maximum power transfer theorem? **R16Ocober/Nov 2020**	2	CO1
Unit -II : VHF, UHF and Microwave Antennas-I:			
1 MARKS QUESTIONS			
1.	The aperture dimensions of a pyramid horn are 12X6 cm. It is operating at a Frequency of 6GHz. Find the beam width? (**R18 May – 2019)**	2	CO2

2.	Yagi-Uda Antenna is working at 100MHz, Calculate the length of reflector? (**R16 NOV/DEC– 2018)**	2	CO2
3.	List and briefly explain three sources of instability of collector current. (**R16- Nov/Dec - 2018)**	1	CO2
4.	Explain the folded dipole diagram	2	CO2
5.	What is Yogi uda array? (**R16March2021)**	1	CO2
6.	List out the modes of helical antenna	4	CO2
7.	Construct the helical antenna	3	CO2
8	What are the types of horns?	1	CO2
9	What is significance of Pitch angle in Helical antenna**? (R16March2021**)	1	CO2
10	Design equation for pyramidal horn antenna?	6	CO2
11	Differentiate Optimal horns from pyramidal horn in terms of design construction? (**R16Ocober/Nov 2020)**	5	CO2
	10 MARKS QUESTIONS		
1	a) Design a three, five element Yagi-Uda antenna to operate at a frequency of 200MHz. b)Calculate Zin of a 3-folded dipole.(**R18 May – 2019) ,(R16Ocober/Nov 2020)**, (**R16March2021)**	5	CO2
2.	Draw and explain the working principle of Helical antenna. Classify the polarization based on axial ratio. (**R16 NOV/DEC– 2018), (R16March2021)**	1	CO2
3.	Prove that folded dipoles act as step –up impedance transformers. (**R16 NOV/DEC– 2018)**	2	CO2
4.	Explain about folded dipole and their characteristics? and radiation resistance? (**R16Ocober/Nov 2020)**	2	CO2
5.	Construction and design considerations for pyramidal horns?	5	CO2
6.	Discuss about the helical antenna and write practical consideration for monofilar helical in different modes? (**R16Ocober/Nov 2020)**	6	CO2

7.	Compare the different types of horn antennas and their performance with sketches?	5	CO2
8	Explain about Fermat's principle?	2	CO2
9	Explain about arrays with parasitic elements?	2	CO2
10	What are the types of horn antennas?	1	CO2
Unit – III : VHF, UHF and Microwave Antennas - II:			
1 MARKS QUESTIONS			
1.	Find the null-to-null main beam width of 2 m parabolic reflector used at 5 GHz. Also find the half power beam width? (**R18 May – 2019)**	1	CO3
2.	List out the types of feeds used in micro strip antennas? **(R16 NOV/DEC– 2018)**	4	CO3
3	What is MSA?	1	CO3
4.	Explain the features of MSA?	2	CO3
5	Compare flat sheet with respect to corner reflector and their practical use? **R16Ocober/Nov 2020**	6	CO3
6.	Compare the merits & demerits of MSA? **(R16March2021)**	6	CO3
7	What is corner sheet reflector antenna? **(R16March2021)**	1	CO3
8.	Define Zoning?	1	CO3
9.	What are the characteristics of Micro strip antennas?	1	CO3
10.	Classify the feed methods of Reflector antennas?	4	CO3
11	List out the applications of lens antennas?	4	CO3
10 MARK QUESTIONS			
1.	a) Explain the optimum F/D ratio condition ii parabolic antenna. b) Calculate the number of images and their signs of 60^{o} corner reflector? **(R18 May – 2019)**	3	CO3

2	For a parabolic reflector of diameter 6 m, illumination efficiency, b=0.65.The Frequency of operation is 10GHz. Find its beam width, directivity and capture area. (**R18 May – 2019)**	2 3	CO3
3.	a) Derive the array factor of a corner reflector 90^{o}. b) List out the types of lens antennas. Explain it. (**R16 NOV/DEC– 2018)**	4	CO3
4	Design a rectangular micro strip antenna using a substrate (RT/duroid 5880) with dielectric constant of 2.2, h =0.1588 cm as to resonate at 10GHz. **(R16 NOV/DEC– 2018)**	5	CO3
5.	List out the characteristics of Micro strip antennas? Classify the feed methods of MSA?	4	CO3
6	Explain about the rectangular patch antenna geometry and their parameters?	2	CO3
7.	Compare the merits and demerits of MSA? Write about geometry of non metallic dielectric lenses? (**R16March2021)**	5	CO3
8.	What are the different types of patch antennas with neat sketches?	1	CO3
9.	What are the different types of Reflector antennas with neat diagrams? &Parabolic antenna? And its feed methods? Explain about Dielectric lenses? (**R16Ocober/Nov 2020)**	2	CO3
10.	Discuss the design of MSA? **(R16March2021)**	6	CO3
11	Explain in detail about the features of MSA's?	2	CO3
12	Compare the merits and demerits of MSA? Write about geometry of non metallic dielectric lenses? **(R16Ocober/Nov 2020)**	5	CO3
13	Discuss the feed methods of Reflector antennas and MSA's? (**R16Ocober/Nov 2020)**	6	CO3
14	Choose the Reflector antennas in which frequency range applications?	3	CO3
Unit-IV : Antenna Arrays			
1MARKS QUESTIONS			

1	Define op-amp parameter input bias current I_{io} **(R16-Nov/Dec-2018)**	1	CO4
2	What is parasitic array, Define Broad side array	1	CO4
3	Distinguish the BSA and EFA? **(R16Ocober/Nov 2020)**	4	CO4
4	Explain about pattern multiplication?	2	CO4
5	Determine the method for Gain measurement?	5	CO4
6	What is pattern measurement arrangement?	1	CO4
7	Apply the concept of pattern multiplication &draw the radiation pattern for 4-element array?	1	CO4
8	Explain the advantages of binomial arrays	2	CO4
9	Compare the different cases for arrays of two isotropic point sources?	2	CO4
	10 MARK QUESTIONS		
1.	Design and draw the radiation pattern on polar graph sheet of 2-element Broad side array antenna at 10 MHz **(R18 May – 2019)**	2	CO4
2.	Define i) BSA ii) EFA iii) EFA with increased Bandwidth iv) Binomial array? **(R18 May – 2019)**	3	CO4
3.	Design and draw the radiation pattern on polar plot of broad side array antenna working at 5 MHz? **(R16 NOV/DEC– 2018)**	5	CO4
4.	Draw the bench setup for gain measurement with 3-Antenna Method? **(R16 NOV/DEC– 2018), (R16March2021)**	1	CO6
5.	Explain array of two point sources. What is an antenna array? Explain different antenna arrays.	2	CO4
6.	Discuss about principle of pattern multiplication. Discuss the features of binomial arrays? **(R16Ocober/Nov 2020) , (R16March2021)**	6	CO4
7.	Explain about short notes on End fire array and Broad side arrays? Explain about pattern multiplication?	2	CO4

8	Determine the expression for the far field pattern of an array of two isotropic point sources at equal amplitude and phase?	3	CO4
9	Explain about the Directivity measurement using any method? (**R16Ocober/Nov 2020)**	1	CO4
10	Explain the principle beam width for BSA and EFA`s?	2	CO4
11	Construct &derive Maxima, minima & half power point directions?	3	CO4
12	Compare different antenna methods?	2	CO6
13	Construct &derive maxima, minima and half power point directions for BSA?	3	CO4
14	Describe the mathematical relations for a N element half-wave length spaced binomial array and find the directivity HPBW for N=20 case and derive the expression for its beam shaping considerations? (**R16Ocober/Nov 2020)**	3	CO4
15	List out the sources of errors?	4	CO4

Unit-V: Wave Propagation – I and II

1 MARKS QUESTIONS

1.	Find the frequency of the propagating wave for D-Layer to have refractive index of 0.5? (**R18 May – 2019)**	1	CO5
2.	Find the critical frequency if the maximum electron density is 1.3X106 electrons/cm^3? (**R16 NOV/DEC– 2018)**	1	CO5
3.	Define duct Propagation & What is multi-hop propagation? **(R16Ocober/Nov 2020**)	1	CO5
4.	Define Absorption?	1	CO5
5.	Discuss about scattering?	6	CO5
6.	What are the fading and path loss in ground wave propagation?	2	CO5

7.	Compare the relation between MUF and skip distance	2	CO5
8	Select the frequency range in sky wave Propagation?	1	CO5
9	Explain about the MUF?&M-Curves	2	CO5
10	Determine the expression for field strength variation with height?	3	CO5
	10 MARK QUESTIONS		
1.	Derive critical frequency of a layer in Sky wave propagation? **(R18 May – 2019)**	3	CO5
2.	Explain i) M-curves ii) Wave Tilt? **(R18 May – 2019), (R16March2021)**	2	CO5
3.	A broadcast transmitter supplies 100 kW to an antenna that radiates 50% of this Power. The antenna has directional Characteristic such that the field strength without ground losses is given by $Eo=300 \times 1.28\sqrt{P_{kW}}$ mV/m at 1 km. Find the field strength of the ground wave at 100km for the following types of Earth conditions at f=500KHz Medium hills, forestation: $\varepsilon r = 13$,$\sigma = 50\times10^{-5}$(mho)/cm **(R16 NOV/DEC– 2018)**	3	CO5
4	Classify the modes of propagation based on frequency. Explain any one of the propagation method? **(R16 NOV/DEC– 2018)**	2	CO5
5.	Discuss about the troposphere and explain how tropospheric ducts can be used for microwave propagation?	6	CO5
6.	Explain and specify the frequency ranges of Ground wave, Space wave and Sky wave propagation? & Explain about the modes of Propagation?	2	CO5
7.	Define the terms (i) MUF (ii) Skip distance (iii) OF (iv) Critical frequency (v) Ray path& LUF **(R16Ocober/Nov 2020) ,(R16March2021)**	1	CO5
8	Compare ground wave propagation, sky wave propagation, space wave propagation?	2	CO5
9	Explain the relation between MUF and skip distance? Explain about virtual height?	2	CO5

10	Distinguish between the Refraction and reflection of sky waves by ionosphere? (**R16Ocober/Nov 2020)**	4	CO5
11	Construct the field strength variation with distance and height? (**R16March2021)**	3	CO5
12	Explain about (a) effects of Earth curvature (b) Absorption (c) Scattering?	2	CO5
13	Discuss a) Tropospheric Propagation b) Multi-hop Propagation c)M-curves?	6	CO5
14	Write a short notes on (a) Plane earth reflections (b) Space and surface waves?	1	CO5

BR-16

Subject Code: R16ECE1108

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech - I Semester –End Examinations (Suppl.) May - 2019

ANTENNAS AND WAVE PROPAGATION

(Electronics & Communication Engineering)

Duration: 3 Hrs **20.05.2019** **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5Qx4M = 20M**

1. If the diameter of the antenna is 2λ, estimate far field distance.
2. The aperture dimensions of a pyramid horn are 12X6 cm. It is operating at a Frequency of 6GHz. Find the beam width?
3. Find the null-to-null main beam width of 2 m paraboloid reflector used at 5 GHz. Also find the half power beam width.
4. List out the differences between indoor and outdoor range Measurement.
5. Find the frequency of the propagating wave for D-Layer to have refractive index of 0.5.

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT – I

6. a) Draw the equivalent circuit of an antenna and explain about Antenna impedance.
   b) Define directivity and gain.

(OR)

7. Derive the EM fields at observation point due to half-wave antenna.

UNIT - II

8. Design a 10-turn helix to operate in the axial mode. For optimum design. Determine the:
   a) Circumference (in λo), pitch angle (in degrees) ,and separation between turns(in λo)
   b) Relative (to free space) wave velocity along the wire of the helix for:
   i) Ordinary end-fire design
   ii) Hansen-woodyard end-fire design

(OR)

9. a) Design a three element Yagi-Uda antenna to operate at a frequency of 200MHz.
b) Calculate Zin of a 3-folded dipole.

UNIT - III

10. a) Explain the optimum F/D ratio condition ii parabolic antenna.
    b) Calculate the number of images and their signs of 60^o corner reflector.

(OR)

11. For a paraboloid reflector of diameter 6 m ,illumination efficiency , b=0.65.The Frequency of operation is 10GHz. Find its beam width, directivity and capture area.

UNIT - IV

12. Design and draw the radiation pattern on polar graph sheet of 2-element Broad side array antenna at 10 MHz.

(OR)

13. Define i)BSA ii) EFA iii)EFA with increased Bandwidth iv) Bionomial array.

UNIT - V

14. Derive critical frequency of a layer in Sky wave propagation.

(OR)

15. Explain i) M-curves ii) Wave Tilt

Subject Code: R16ECE1108

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)
Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech - I Semester –End Examinations (Regular) Nov/Dec -2018

ANTENNAS AND WAVE PROPAGATION

(Electronics & Communication Engineering)

Duration: 3 Hrs **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5Qx4M = 20M**

1. If beam solid angle is π steradians, Calculate directivity in dB?
2. Yagi-Uda Antenna is working at 100MHz, Calculate the length of reflector?
3. List out the types of feeds used in microstrip antennas. Define.
4. Calculate the excitation Phase, if scanned array direction is 60^{o}.
5. Find the critical frequency if the maximum electron density is $1.3X10^{6}$ electrons/cm^{3}.

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

6. a) Find the Rrad of Infinitesimal dipole whose overall length is $l=\lambda/50$.
   b) Find the radiation resistance of a loop antenna of diameter 0.5m operating at 1MHz

(OR)

7. a) The radiation intensity is represented by

$$U = \begin{cases} U_0 \sin(\pi \sin\theta), & 0 \le \theta \le \pi/2 \text{ and} \\ 0 & \text{else where} \end{cases}$$

   Find exact directivity.
   b)The maximum gain of a horn antenna is +20 dB, While the gain of its first sidelobe is -15dB. What is the difference in gain between the maximum and first sidelobe in dB.

UNIT - II

8. Draw and explain the working principle of Helical antenna. Classify the polarization based on axial ratio.

(OR)

9. Prove that folded dipoles act as step –up impedance transformers.

UNIT - III

10. a) Derive the array factor of a corner reflector 90^o.
    b) List out the types of lens antennas. Explain it.

(OR)

11. Design a rectangular microstrip antenna using a substrate (RT/duroid 5880) with dielectric constant of 2.2, h =0.1588 cm as to resonate at 10GHz.

UNIT - IV

12. Design and draw the radiation pattern on polar plot of broad side array antenna working at 5 MHz?

(OR)

13. Draw the bench setup for gain measurement with 3-Antenna Method.

UNIT - V

14. A broadcast transmitter supplies 100 kW to an antenna that radiates 50% of this power. The antenna has directional Characteristic such that the field strength without ground losses is given by $Eo=300 \times 1.28\sqrt{P_{kW}}$ mV/m at 1 km. Find the field strength of the ground wave at 100km for the following types of Earth conditions at f=500KHz
    Medium hills, forestation: $\varepsilon r = 13$,$\sigma = 50 \times 10^{-5}$(mho)/cm

(OR)

15. Classify the modes of propagation based on frequency. Explain any one of the propagation method.

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - I Semester - II Mid Term Examinations

(R16ECE1108) ANTENNAS AND WAVE PROPAGATION - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 31.10.2019 FN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. Define zoning.
2. List out the types of arrays.
3. Explain about the pattern multiplication.
4. Define duct propagation.
5. Select the frequency range in sky wave propagation.

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. Explain about paraboloidal reflector antenna with neat diagram.
7. Explain about the directivity measurement using any method.
8. Construct and derive maxima, minima and half power point directions for EFA.
9. a) Compare the types of arrays?

   b) A uniform linear array consists of 16 isotropic point sources with a spacing of □/4. Draw the field pattern using pattern multiplication?
10. Explain about the modes of propagation.
11. Discuss a) Tropospheric propagation b) Multi-hop propagation c) M-curves.

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - I Semester - I Mid Term Examinations

(R16ECE1108) ANTENNAS AND WAVE PROPAGATION - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 27.08.2019 FN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. Explain the different types of patterns in antennas.
2. Classify the antenna field zones.
3. Construct the helical antenna.
4. What are the types of horns?
5. Compare the merits and demerits of MSA.

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. Explain the following: i) Radiation Intensity ii) Antenna Temperature iii) Effective aperture.
7. Solve the expression for electric and magnetic field radiated by the half wave dipole antenna.
8. Explain about Retarded Potentials.
9. Classify the modes of helical antenna.
10. Compare the different types of horn antennas and their performance with sketches.
11. What are the characteristics of MSA? Explain in detail.

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - I Semester - I Mid Term Examinations

(R16ECE1108) ANTENNAS AND WAVE PROPAGATION - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 28.08.2018 FN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. Write the Maxwells equations?
2. What is Rr for half wave dipole?
3. Draw the neat diagram of pyramidal horn?
4. What are the types of horns?
5. What are the merits of MSA?

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. a) Write in detail i) Antenna radiation pattern ii) Resolution iii) Effective aperture.
   b) The radiation resistance of an antenna is 72Ω and loss resistance is 8Ω. What is its directivity and if the power gain is 16?
7. a) What is loop antenna? What are the applications of loop antenna?
   b) Derive the equations for Directivities of small and large loops.
8. Draw the diagram of 3 –element Yagi-Uda Array and working principle of Yagi – Uda antenna with equations.
9. a) With neat sketch, explain the construction and design considerations for pyramidal horns.
   b) What are the types of horn antennas?
10. Draw and explain about the Folded dipole and their characteristics.
11. a) Write in detail the features of MSA's.
    b) What are the demerits of MSA?

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BR-16 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

III B.Tech - I Semester - II Mid Term Examinations

(R16ECE1108) ANTENNAS AND WAVE PROPAGATION - (Electronics & Communication Engineering)

Duration: 90Mins **Date: 02.11.2018 FN** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5Qx1M = 5M**

1. What is applications of lens antennas?
2. Write the difference between BSA and EFA.
3. Draw the radiation pattern for 4-element array using pattern multiplication.
4. Define MUF.
5. Write the relation between MUF and skip distance.

Section – B

Answer any *FOUR* questions **Marks: 4Qx5M = 20M**

6. Draw the neat diagram of non metallic dielectric lenses and write in detail.
7. a) What is principle of pattern multiplication?
   b) What are the features of binomial arrays?
8. Derive the expression for the far field pattern of an array of two isotropic point sources at equal amplitude and phase.
9. Write in detail about the pattern measurement using any method with neat diagrams.
10. a) Define and specify the frequency ranges of Ground wave, Space wave and Sky wave propagation.
    b) What are the modes of wave propagation?
11. Define the terms i) MUF ii) Skip distance iii) OF iv) Critical frequency v) Ray path.

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BR-16 HallTicket No.: D

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)(Recognized under 2(f) and 12(B) of UGC Act 1956)

III B.Tech - I Semester –End Examinations (Suppl.) October/November-202

R16ECE1108 – ANTENNAS AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Duration:2 Hrs 05.11.2020 (AN) Max Marks:70M

Section – A

Answer Any Three of the following questions. Marks: 3Qx6M =18M

1. Write about the dual characteristics of an antenna.
2. Differentiate optimal horns from pyramidal horns in terms of design construction.
3. Compare flat sheet reflector with respect to corner reflectors and their practical use.
4. Distinguish the broad side arrays from end fire arrays in brief.
5. Discuss about multi hop propagation and its advantage.

Section – B

Answer *FOUR* questions from the following Marks: 4Qx13M = 52M

UNIT – I

6. a)Find out the directivity and effective length of a λ/2 dipoles using appropriate radiation Resistances.
   b) Mention about the effective area and effective height of an antenna.

(OR)

7. State the following antenna theorems and bring out their importance in antenna measurements
   a) Reciprocity theorem.
   b) Maximum power transfer theorem.

UNIT - II

8. Discuss about the helical antennas and write the practical design considerations for monofilar helical in different modes.

(OR)

9. a) Write a note on folded dipole antenna and find its radiation resistance .
   b) Describe the principle of working of a 3 element yagi antenna.

UNIT - III

10. Describe the requirements for a reflector antennas and write about parabolic reflector and establish the gain and beam width relations for a Parabolic reflector and account for its beam shaping considerations

(OR)

11. a) Write the different feed methods used for VHF,UHF and Microwave antennas
    b) Mention about the lens antennas and non metallic dielectric lenses and their requirements.

UNIT - IV

12. Describe the mathematical relations for a N element half-wavelength spaced binomial array and find the directivity, HPBW for N=20 case and derive the expression for its field pattern.

(OR)

13. Discuss in detail about the following
    a) Pattern measurement arrangement b) Directivity measurement.

UNIT-V

14. Discuss the structure of ionosphere and the phenomena's of reflection and refraction of sky waves in ionosphere.

P.T.O

Subject Code: R16ECE1108 17D41A0402

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

III B.Tech I Semester (SUPPL.) End Examinations March - 2021

ANTENNAS AND WAVE PROPAGATION

15/03/2021 **(Electronics and Communication Engineering)** **Day- 3 (FN)**

Duration: 3 Hrs **Marks: 5Qx14M = 70M**

Answer *FIVE* questions (Treat Q.No.11 as a single question).

UNIT-I

1. a) Define directivity and explain the different techniques to estimate directivity.
   b) Derive the various field components radiated from circular aperture and also find beamwidth and effective area?

(OR)

2. a) Calculate the radiation efficiency of a short dipole which is $\lambda/15$ m long and it has $R_{loss}=1.5\Omega$.
   b) Explain the radiation mechanism from dipoles.

UNIT-II

3. a) Explain in detail the working principle of Helical antenna in :
   i) Normal mode.
   ii) Axial mode.
   b)Find the directivity of 10 turn helix antenna having pitch angle 100 , circumference C equal to λ.

(OR)

4. a) Explain the designing of 5-element yagi-uda antenna?
   b) Design a five turn helical antenna which at 400MHz operates in the normal mode. The spacing between turns is $\lambda/50$. It is desired that the antenna possesses circular polarization. Determine the circumference of the helix and the overall length of the entire helix.

UNIT-III

5. a) Discuss the design of a microstrip antenna.
   b) Derive the field gain of a flat sheet corner reflector.

(OR)

6. a) Describe the cassegrain method of feeding a parabolic reflector antenna
   b) Discuss the geometry of Non-metallic Dielectric lenses.

UNIT-IV

7. a) By using pattern multiplication technique, Estimate the radiation pattern of N=3 element, $d=\lambda/2$ of binomial array Antenna.
   b) Explain the Gain Measurement 3-antenna method.

(OR)

8. a) Draw the radiation pattern of 8 – isotropic elements fed in phase, spaced $\lambda/2$ apart with the principle of pattern multiplication.
   b) Discuss in detail about arrangements for Pattern Measurement.

UNIT-V

9. a) Derive the field strength equation in a space wave propagation.
   b) Define MUF and Critical frequency. Derive the expressions for the same.

(OR)

10. a) Describe the troposphere and explain how tropospheric ducts can be used for microwave propagation.
    b) Explain wave tilt effect in ground wave propagation.

P.T.O.

11. **Answer any *THREE* questions from the following.** **(5M+5M+4M)**

a) Define the Radiation Intensity and Effective Height.

b) What is the significance of pitch angle in Helical Antenna?

c) What are the advantages and limitations of Microstrip Antennas?

d) What is optimum spacing used in parasitic array? Why?

e) What is Secant law?

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EMBEDDED SYSTEM DESIGN

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester

L	T	P	C
3	1	0	3

Professional Elective - II

(R18ECE3221) Embedded System Design

Course Objectives:

For embedded systems, the course will enable the students to:

- Understand the basics of an embedded system
- Program an embedded system
- To learn the method of designing an Embedded System for any type of applications.
- To understand operating systems concepts, types and choosing RTOS.
- Design, implement and test an embedded system.

UNIT -I:

Introduction to Embedded Systems: Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT -II:

Typical Embedded System: Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT -III:

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

	SRI INDU COLLEGE OF ENGG & TECH **LESSON PLAN** **(Regulation :R18)** **Department of Electronics and Communication Engineering**	**Prepared on** **Rev1:** **Page: 1 of 8**

Sub. Code & Title	**R18ECE3221& Embedded system Design**	
Academic Year: 2020-21	**Year/Sem./Section**	**III/II/A&B&C&D**
Faculty Name & Designation	**D.SANDHYA RANI, AP/ECE ,Dr.P.RAMESH , P/ECE**	

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT – I							
I	**INTRODUCTION TO Embedded Systems**					**12**		
1.1	Definition of Embedded Systems	T1,R1,R2	4 3 1	 4	Black board	02	22/3/21,23/3/21	CO-1, L1
1.2	Embedded Systems /General computing systems	T1	4	5	Black board	01	24/3/21	CO-1,L2
1.3	History of Embedded systems	T1,R3	5 42	6 43	Black board	01	25/3/21	CO-1,L2
1.5	Classification	T1,R1	7 52	 53	Black board	02	26/3/21,30/3/21	CO-1,L4
1.6	Major applications areas	T1 R1 R3	7 27 44	8 28 69	Presentation	02	31/3/21,1/4/21	CO-1,L3
1.7	Purpose of Embedded systems	T1	8	11	Black board	01	6/4/21	CO-1,K5
1.8	Characteristics and quality attributes of embedded systems	T1 R2	72 19	79 24	Black board	03	7/4/21,8/4/21,9/4/21	CO-1,K6
	Review	**Signature of the HOD/Coordinator**						

Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	**Actual Date of Handled**	**CO/RBT**
	UNIT –II							
II	**Typical Embedded Systems**					**16**		
2.1	Core of the Embedded Systems	T1	17		Black board	01	12/4/21	CO-2,K2
2.2	General purpose and Domain specific processors	T1 R1 R2	18 5 9	25 10 12	Black board	02	15/4/21,20/4/21	CO-2,K2
2.3	ASIC'S	T1 R2	26 276	277	Presentation	01	22/4/21	CO-2,K3
2.4	PLD'S	T1 R1	26 277	28 280	Presentation	01	23/4/21	CO-2,K2
2.5	Commercial Off the shelf components(COTS)	T1	28		Black board	01	27/4/21	CO-2,K2

2.6	Memory:ROM ,RAM	T1 R1 R2	28 106 112	32 109 125	Black board	02	29/4/21,3/5/21	CO-2,K4
2.7	Memory according to the type of interface	T1	32	33	Black board	01	5/5/21	CO-2,K2
2.8	Memory shadowing	T1	33		Black board	01	6/5/21	CO-2,K2
2.9	Memory selection for Embedded systems	T1 R1	33 118	35 121	Black board	01	12/5/21	CO-2,K3
2.10	Sensors and Actuators	T1 R2	35 90	44 101	Black board	02	17/5/21,18/5/21	CO-2,K5
2.11	Communication Interface :On board and External communication interface	T1 R1 R2	45 160 166	59 170 175	Black board	03	20/5/21,24/5/21	CO-2,K6
	Review	**Signature of the HOD/Coordinator**						

UNIT- III							
Embedded Firmware					**08**		
Reset Circuit	T1 R1	60 11	61	Black board	01	25/5/21	CO-3,K2
Brown out protection circuit	T1	61		Black board	01	26/5/21	CO-3,K2
Oscillator circuit	T1	62		Black board	01	27/5/21	CO-3,K2
Real Time clock	T1 R1	62 158	159	Black board	01	10/6/21	CO-3,K2
Watch dog Timer	T1 R1 R2	63 157 88	158 90	Black board	01	11/6/21	CO-3,K3
Embedded Firmware design approaches and Development Languages	T1 R1	302 235	318 28	Black board	03	15/6/21,16/6/21,18/6/21	CO-3,K4
	Review	**Signature of the HOD/Coordinator**					
UNIT-IV							
IV	**RTOS based Embedded system Design**				**10**		

4.1	**Operating System Basics**	T1 R1 R3	382 351 202	386 370 222	Presentation	03	21/6/21,22/6/21,23/6/21	CO-4,K2
4.2	Types of operating Systems	T1 R1 R3	386 370 211	390 384 222	Presentation	01	28/6/21	CO-4,K2
4.3	Tasks,Process, and Threads	T1 R1 R3 R4	390 305 222 137	402 314 228 153	Black board	02	29/6/21,30/6/21	CO-4,K4
4.4	Multiprocessing and Multitasking	T1 R3	402 224	404	Black board	01	1/7/21	CO-4,K5
4.5	Task scheduling	T1 R1 R3 R4	404 385 226 253	422 401 241 259	Black board	03	2/7/21,5/7/21,7/7/21	CO-4,K6
	Review	**Signature of the HOD/Coordinator**						
	UNIT-V							
V	**Task Communication**					**14**		
5.1	Shared Memory	T1 R1 R3 R4	426 339 241 181	433 341 246	Black board	02	8/7/21,9/7/21	CO-5,K2
5.2	Message passing	**T1** **R1** **R3** **R4**	433 335 241 176	439 339 246 180	Black board	02	12/7/21,13/7/21	CO-5,K2
5.3	Remote procedure call and Sockets	T1 R1	439 341	442 345	Black board	01	14/7/21	CO-5,K2
5.4	Task synchronization	T1	442		Black board	01	15/7/21	CO-6,K1
5.5	Task Communication/Synchronization issues	T1 R3	443 255	456 263	Black board	03	16/7/21,19/7/21,20/7/21	CO-6,K4
5.6	Task synchronization Techniques	T1 R1 R3	456 314 263	476 335 269	Presentation	02	22/7/21,23/7/21	CO-6,K5

5.7	Device drivers	T1 R3	476 246	478 250	Black board	01	26/7/21	CO-5,K2
5.8	How to choose an RTOS	T1 R1	478 408	480 473	Black board	02	27/7/21,29/7/21	CO-6,K5
	Review	**Signature of the HOD/Coordinator**						

LIST OF TEXT BOOKS AND REFERENCES

Text Books:

T1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

Reference Books:

R1. Embedded Systems - Raj Kamal, TMH.
R2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
R3. Embedded Systems – Lyla, Pearson, 2013
R4. An Embedded Software Primer - David E. Simon, Pearson Education.

Web links

w-1. https://www.elprocus.com/real-time-applications-of-embedded-systems/

w-2. https://www.javatpoint.com/peripheral-devices#

w-3. https://www.embien.com/blog/embedded-system-design-memory-selection/

w-4. https://techdifferences.com/difference-between-sensors-and-actuators.html

w-5. https://www.embedded.com/introduction-to-watchdog-timers/

w-6. https://www.embeddedtutor.com/2019/02/watchdog-timer-in-embedded-system.html

w-7. https://www.cis.upenn.edu/~lee/06cse480/lec-into_to_prog_embedded_systems.pdf

w-8. https://iqramali.medium.com/role-of-rtc-real-time-clock-in-embedded-devices-35dbd2e8f9e7

w-9. https://www.tutorialspoint.com/operating_system/index.htm

w-10. https://www.guru99.com/real-time-operating-system.html

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1.	Designing of embedded system using any microcontroller	PPT Presentation		N.C Sendhilkumar	PO1,PO2,PO3,PO5	PSO1,PSO2,PSO3
2.	Integration and Testing of Embedded Hardware and firmware	PPT Presentation		N.C Sendhilkumar	PO1,PO2,PO4,PO5	PSO1,PSO2,PSO3
3.	Introduction to Embedded system Design with VxWorks and MicroC/OS-II RTOS	PPT Presentation		N.C Sendhilkumar	PO1,PO2,PO3,PO5	PSO1,PSO2,PSO3

Assignment

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1	Compare the General purpose computing system and Embedded system? (K2-Understanding)	CO-1	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
2	Identify the operational quality attributes of Embedded systems? (K3-Apply)	CO-1	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
3	Explain the structural units in a General purpose processors? K2-Understanding)	CO-2	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
4	Explain external communication Interfaces?(K5-Evalauting)	CO-2	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
5	Extend the Watchdog Timer in embedded systems?(K2-Understanding)	CO-3	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21

6	Compare the embedded firmware development languages?(K4-Anzalying)	CO-3	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
7	Illustrate the Memory management and time management of operating systems? ?(K2-Understand)	CO-4	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
8	Contrast the types of Non Preemptive scheduling algorithms? K4-Analyzing)	CO-4	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
9	What is Socket & Explain about Sockets? K2-Understand)	CO-5	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21
10	Explain the RTOS for the embedded systems?(K5-Evaluating)	CO-6	Introduction to Embedded Systems by **SHIBU**	17/5/21	24/5/21

SELF STUDY TOPICS

S.No.	Topics	Books & Journals	Course Outcomes
1.	Analog Electronic components and Digital Electronic components	Introduction to Embedded Systems by **SHIBU**	CO-2,CO-3
2.	PCB Layout Design & Fabrication	Introduction to Embedded Systems by **SHIBU**	CO-2

	SRI INDU COLLEGE OF ENGG & TECH **QUESTION BANK** **(Regulation :R18)** **Department of Electronics and Communication Engineering**	**(Regulation :R18)** **Prepared on** **Rev1:** **Page: 1 of 5**

Sub. Code & Title	**R18ECE3221& Embedded system Design**		
Academic Year: 2020-21		**Year/Sem**	**III/II**
Faculty Name & Designation	**D.SANDHYA RANI, AP/ECE ,Dr.P.RAMESH, P/ECE**		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 5. Creating)

(2.

UNIT-1 Introduction to Embedded Systems			
	2MARKS QUESTIONS	**BT Level**	**Course Outcome**
1.	What is embedded system? **(R14-Nov/Dec-2017) (R16-December-2019)**	1	CO1
2.	List out any four difference of Microprocessor and Microcontroller?	1	CO1
3.	What is microprocessor?	1	CO1
4..	What is microcontroller?	1	CO1
5.	Define AGC?	1	CO1
6.	Classify the embedded Systems?	2	CO1
7.	Identify the purpose of embedded systems?	3	CO1
8	Categorize the applications of embedded systems? **(R16-March-2021) (R16-December-2019)**	4	CO1
9	List out the quality attributes of embedded systems?	4	CO1
10	Discuss the characteristics of embedded systems?	2	CO1
	10 MARKS QUESTIONS		
1.	What is embedded system & Classify of embedded system based on generation**? (R14-Nov/Dec-2017) (R16-December-2019)**	2	CO1
2.	Explain about the AGC (Apollo Guidance Computer)	2	CO1
3.	Compare the General purpose computing system and Embedded system**? (R14-Nov/Dec-2017)**	2	CO1
4.	Interpret the characteristics of Embedded System?	2	CO1
5.	Classify of embedded system based on Performance And Complexity?	2	CO1
6.	Explain the purpose of embedded systems? **(R16-December-2019)**	2	CO1
7.	Categorize the major Application Area of Embedded System?	4	CO1
8	Classify the embedded systems based on deterministic behavior and triggering?	4	CO1
9	Identify the operational quality attributes of Embedded systems? **(R13-Mar-2017) (R14-Nov/Dec-2017) (R16-March-2021)**	3	CO1
10	Explain the non operational quality attributes of embedded systems? **(R16-March-2021)**	5	CO1

Unit -II : Typical Embedded System			
2 MARKS QUESTIONS			
1.	What is PLD	1	CO2
2.	What is ROM memory	1	CO2
3.	What is RAM memory	1	CO2
4.	Classify the ROM	2	CO2
5.	What is ASIC?	1	CO2
6.	Demonstrate the components of embedded systems?	2	CO2
7.	Identify the sensors and actuators of embedded systems?	3	CO2
8	Make use of LED,LCD	3	CO2
9	Make use of stepper motor	3	CO2
10	Explain the communication interfaces	5	CO2
10 MARKS QUESTIONS			
1	Explain the structural units in a general purpose processors?	2	CO2
2.	Compare the RISC and CISC processors?	2	CO2
3.	Explain about Memory devices in a system **(R16-March-2021)** a) ROM b) RAM	2	CO2
4.	Interpret the Memory selection for an Embedded system? **(R16-March-2021)**	2	CO2
5.	Contrast the microprocessor and microcontroller?	2	CO2
6.	Illustrate the concept of Memory shadowing? **(R14-Nov/Dec-2017) (R16-December-2019)**	2	CO2
7.	Examine the different Sensors and actuators? **(R16-December-2019)**	4	CO2
8	Survey the PLD and ASIC? **(R16-December-2019)**	4	CO2
9	Examine the internal communication interfaces? **(R16-March-2021)**	4	CO2
10	Explain external communication Interfaces? **(R14-Nov/Dec-2017)**	5	CO2
Unit – III : Embedded Firmware			
2 MARKS QUESTIONS			
1.	What is Reset circuit?	2	CO3
2.	Demonstrate the oscillator circuit for embedded systems?	2	CO3

3	What is Brown out protection circuit?	2	CO3
4.	What is Real time clock?	2	CO3
5	Demonstrate the Watchdog timer **(R16-December-2019)**	2	CO3
6.	Compare the embedded firmware design approaches?	2	CO3
7	Choose the development languages in embedded firmware?	3	CO3
8.	List out any five differences of low level language and High level language?	4	CO3
9.	Examine the embedded firmware design approaches?	4	CO3
10.	Build the reset circuit?	6	CO3
	10 MARK QUESTIONS		
1.	Explain reset circuit with circuit diagram? **(R14-Nov/Dec-2017) (R16-December-2019)**	2	CO3
2	Demonstrate Brown-out protection circuit with circuit diagram? **(R14-Nov/Dec-2017) (R16-March-2021) (R16-December-2019)**	2	CO3
3.	What is oscillator? Interpret the oscillator unit? **(R14-Nov/Dec-2017) (R16-March-2021)**	2	CO3
4	Illustrate the Real Time Clock in embedded systems?	2	CO3
5.	Extend the Watchdog Timer in embedded systems?	2	CO3
6	Explain about Embedded firmware design approaches**? (R14-Nov/Dec-2017) (R16-March-2021)**	2	CO3
7.	Compare the embedded firmware development languages**? (R16-March-2021) (R16-December-2019)**	4	CO3
8.	Distinguish between embedded firmware design approaches?	4	CO3
9.	Examine the conventional approach (super loop approach) for firmware design?	4	CO3
10.	Compare the high level and Low level language?	5	CO3
	Unit-IV : RTOS Based Embedded system design		
	2 MARKS QUESTIONS		
1.	Define operating system? **(R14-Nov/Dec-2017)**	2	CO4
2.	Define real time operating system? **(R14-Nov/Dec-2017)**	2	CO4
3.	What is Kernel?	2	CO4
4.	List out types of Operating Systems? **(R16-December-2019)**	2	CO4
5.	Name then basic functions of real time Kernel?	2	CO4
6.	Define process, task, thread?	2	CO4
7.	List out types of multitasking?	4	CO4

8	Identify the Throughput and CPU utilization?	3	CO4
9	Contrast the turn -around time, Waiting Time, Response Time?	4	CO4
10	Explain Task Scheduling?	5	CO4
	10 MARK QUESTIONS		
1.	Explain Operating system architecture?	2	CO4
2.	Compare the Kernel space and user space?	2	CO4
3.	Extend the types of operating systems?	2	CO4
4.	Illustrate the Memory management and time management of operating systems?	2	CO4
5.	Summarize the Process, task and Thread? **(R16-December-2019)**	2	CO4
6.	Interpret the structure of Process in operating systems?	2	CO4
7.	Identify the Multiprocessing and multitasking? **(R14-Nov/Dec-2017) (R16-December-2019)**	3	CO4
8	Compare the types of multitasking?	4	CO4
9	Contrast the types of Non Preemptive scheduling algorithms? **(R14-Nov/Dec-2017) (R16-March-2021)**	4	CO4
10	Discuss the Preemptive scheduling algorithms? **(R14-Nov/Dec-2017) (R16-March-2021)**	6	CO4

Unit-V: Task communication

2 MARKS QUESTIONS

1.	Define Cooperating Processes and Competing Processes?	1	CO5
2.	What is task communication?	1	CO5
3.	What is shared memory?	1	CO5
4.	Define message passing?	1	CO5
5.	List out task synchronization techniques?	1	CO5
6.	Illustrate the task synchronization Issues?	2	CO5
7.	Examine the starvation, Deadlock, Live lock?	4	CO5
8	Interpret the sockets?	4	CO5
9	Survey the device drivers?	4	CO5
10	Choose an RTOS for an embedded system? **(R14-Nov/Dec-2017) (R16-December-2019)**	6	CO5

10 MARK QUESTIONS

1.	Explain about sharing of memory? **(R14-Nov/Dec-2017) (R16-March-2021)**	2	CO5
2.	Interpret the Message passing? **(R14-Nov/Dec-2017)**	2	CO5
3.	Discuss about Remote procedure call and sockets? **(R16-December-2019)**	2	CO5
4	What is Socket & Explain about Sockets?	2	CO5
5.	Illustrate the Priority inversion?	2	CO6
6.	Discuss about Task Communication issues? **(R14-Nov/Dec-2017)**	2	CO6
7	Survey the Dining Philosophers problem and Producer	4	CO6
8	Examine Task synchronization techniques? **(R14-Nov/Dec-2017) (R16-December-2019)**	4	CO6
9	Analyze the device drivers? **(R16-March-2021)**	4	CO5
10	Explain the RTOS for the embedded systems? **(R14-Nov/Dec-2017)**	5	CO6

BR-16 HallTicket No.: 17D45A0406 D4

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)(Recognized under 2(f) and 12(B) of UGC Act 1956)

IV B.Tech - I Semester –End Examinations (Regular) December-2019

R16ECE1121 – EMBEDDED SYSTEMS DESIGN

(Electronics and Communication Engineering)

Duration: 3 Hrs 09.12.2019 **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5Qx4M = 20M**

1. Define Embedded System and write its applications.
2. What is meant by Memory Shadowing?
3. Discuss the importance of watchdog timer.
4. Write the names of the operating systems.
5. How to choose the RTOS?

Section – B

Answer any *FIVE* questions choosing at least one from each Unit **Marks: 5Qx10M = 50M**

UNIT – I

6. Explain the purpose of Embedded System in detail with examples.

(OR)

7. Explain the classification of Embedded system based on generations.

UNIT – II

8. *Explain in detail* about the ASIC and PLD's

(OR)

9. *Discuss in detail* about Sensors, Actuators and I/O Subsystem.

UNIT - III

10. *Illustrate* about (i) Reset circuit (ii) Brown and Protection Circuit

(OR)

11. Explain the importance about development languages for Embedded system.

UNIT – IV

12. Discuss in detail about the Task, Process and Threads.

(OR)

13. Summarize briefly about Multiprocessing and Multitasking.

UNIT-V

14. Explain briefly about the Remote Procedure Call and Sockets.

(OR)

15. Demonstrate about Task Synchronization Techniques.

***

D4

BR-16 Write Your Ht.No.
Subject Code: R16ECE1121

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi) - Recognized under 2(f) and 12(B) of UGC Act 1956

IV B.Tech I Semester (Reg./Suppl.) End Examinations March - 2021

EMBEDDED SYSTEMS DESIGN

(Electronics and Communication Engineering)

13/03/2021 Day- 3 (AN)

Duration: 3 Hrs Marks: 5Qx14M = 70M

Answer *FIVE* questions (Treat Q.No.11 as a single question).

UNIT-I

1. Explain the different applications of embedded systems?

(OR)

2. Describe the following quality attributes :
   a) maintainability
   b) throughput
   c) safety

UNIT-II

3. List out the different types of memories used for program storage in embedded systems design? And explain in detail.

(OR)

4. Distinguish between (a)CISC and RISC processors (b) I2C and SPI communication interface.

UNIT-III

5. What is embedded firmware? What are the different approaches available for embedded firmware development?

(OR)

6. a) Explain the role of oscillator circuit and brown out protection circuit.
   b) Define the functionality of cross compiler conversion.

UNIT-IV

7. Explain the different types of preemptive scheduling algorithms. State the merits and demerits of each.

(OR)

8. Describe how multithreading can improve the performance of an application with an illustrative example.

UNIT-V

9. a) What is semaphore? Explain the different types of semaphores. Where it is used?
   b) Discuss about the sleep and wakeup mechanism for mutual exclusion.

(OR)

10. Explain in detail about the architecture of Device drivers.

P.T.O.

11. **Answer any *THREE* questions from the following.** **(5M+5M+4M)**

a) State the advantages and disadvantages of embedded system.

b) Define actuator. Explain its role in embedded system design

c) What is pseudo-ops.? What is the use of it in assembly language programming?

d) Discuss the following : task control block and process control block,

e) How to handle deadlocks?

*****

Subject Code: R14ECE1121

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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Recognized under 2(f) and 12(B) of UGC Act 1956

IV B.Tech - I Semester –End Examinations (Regular) Nov/Dec - 2017

EMBEDDED SYSTEMS DESIGN

(Electronics & Communication Engineering)

Duration: 3 Hrs **Max Marks: 70M**

Section – A

Answer *All* the following questions **Marks: 5x4 = 20M**

1. Define Embedded system with some applications.
2. Discuss about Memory Shadowing.
3. What are fundamental steps to HEX File creation?
4. Differentiate Operating system and Real Time Operating System.
5. Discuss about how to choose an RTOS.

Section – B

Answer any *FIVE* questions choosing at least one from each Unit

Marks: 5x10 = 50M

UNIT - I

6. Explain in detail about Classification of embedded systems.

(OR)

7. Explain about Quality Attributes of embedded system.

UNIT - II

8. Explain about following concept in External Communication interface
   i) USB ii) IrDA iii) ZigBee

(OR)

9. Explain in detail about General Purpose and Domain specific processors.

UNIT - III

10. Explain about following below terms
    i)Reset Circuit ii) Brown-out circuit iii) Oscillator Unit

(OR)

11. Explain in detail about embedded firmware design approaches.

UNIT - IV

12. Define task scheduling. Explain about task scheduling.

(OR)

13. Differentiate Multiprocessing and Multitasking.

UNIT-V

14. Explain below terms in Task Communication
    i) Shared Memory ii) Message passing.

(OR)

15. Explain Issues Task communication/Synchronization.

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BR-14 **SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY** **D4**

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

IV B.Tech - I Semester - I Mid Term Examinations

(R14ECE1121) EMBEDDED SYSTEMS DESIGN

(Electronics & Communication Engineering)

Duration: 90Mins **Date: 30.08.2017** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5x1 = 5M**

1. What is microcontroller?
2. List out memories of embedded systems.
3. What is memory shadowing?
4. Write a short notes on Actuators.
5. What is Real time clock?

Section – B

Answer any *FOUR* questions **Marks: 4x5 = 20M**

6. Describe the Purpose of Embedded System.
7. Explain about quality attributes of Embedded systems.
8. Discuss about Sensors.
9. Explain about PLDS.
10. Explain about communication Interfaces.
11. Explain Brown-out protection circuit with circuit diagram.

BR-14 SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY D4

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

IV B.Tech - I Semester - II Mid Term Examinations

(R14ECE1121) EMBEDDED SYSTEMS DESIGN

(Electronics & Communication Engineering)

Duration: 90Mins **Date: 08.11.2017** **Max Marks: 25M**

Section – A

Answer *All* the questions **Marks: 5x1 = 5M**

1. Discuss about Watchdog timer.
2. What is process?
3. Discuss about Threads.
4. Write about task synchronization.
5. Write about device drivers.

Section – B

Answer any *FOUR* quest **Marks: 4x5 = 20M**

6. Explain about embedded firmware development languages.
7. Explain about multiprocessing.
8. Explain about multitasking.
9. Explain task scheduling.
10. Discuss about Task Communication issues.
11. What is an RTOS and How to choose an RTOS?

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Consumer Electronics

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

B.Tech. - III Year – II Semester **OPEN ELECTIVE- I**

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(R18ECE3273) Consumer Electronics

Course Objectives:

- Students are able to understand consumer electronics fundamentals, microprocessors and microcontrollers, energy management and intelligent building perspective. Audio systems, Display systems, video systems and recording systems
- Student is able to demonstrate smart Home, Home Virtual Assistants, Home security systems and types of sensors RFID Home , kitchen electronics and smart alarms, smart toilet, smart floor and smart locks
- Students are able to discuss cordless telephones, Fax machines PDA's TABLETs Smart phones and Smart watches. Video conferencing systems, Internet enabled systems, Wi-Fi, Li-Fi, GPS and Tracking systems

UNIT I:**Consumer Electronics Fundamentals** - History of Electronic Devices- Vacuum Tubes, Transistors, Integrated Circuits- Moorse Law, Semiconductor Devices, Diodes, Rectifiers, Transistors, Logic Gates, Combinational Circuits, ADC, DAC and Microprocessors, Microprocessor Vs Microcontrollers, Microcontrollers in consumer electronics, Energy management, Intelligent Building Perspective.

UNIT II: Entertainment Electronics - Audio systems: Construction and working principle of : Microphone, Loud speaker, AM and FM receiver, stereo, 2.1 home theatre, 5.1 home theatre . Display systems: CRT, LCD, LED and Graphics displays Video Players : DVD and Blue RAY. Recording Systems: Digital Cameras and Camcorders.

UNIT III: Smart Home - Technology involved in Smart home, Home Virtual Assistants- Alexa and Google Home. Home Security Systems - Intruder Detection, Automated blinds, Motion Sensors, Thermal Sensors and Image Sensors, PIR, IR and Water Level Sensors.

UNIT IV: **Home Appliances** - Home Enablement Systems: RFID Home, Lighting control, Automatic Cleaning Robots, Washing Machines, Kitchen Electronics- Microwave, Dishwasher, Induction Stoves, Smart Refrigerators, Smart alarms, Smart toilet, Smart floor, Smart locks.

UNIT V: **Communication Systems** - Cordless Telephones, Fax Machines, PDAs- Tablets, Smart Phones and Smart Watches. Introduction to Smart OS- Android and iOS. Video Conferencing Systems- Web/IP Camera, Video security, Internet Enabled Systems, Wi-Fi, IoT, Li-Fi, GPS and Tracking Systems, Contemporary Topics.

TEXT BOOKS:

1. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018.
2. Philp Hoff "Consumer Electronics for Engineers" - Cambridge University Press.1998.
3. Jordan Frith, " Smartphones as Locative Media ", Wiley. 2014.
4. Dennis C Brewer, " Home Automation", Que Publishing 2013.
5. Thomas M. Coughlin, "Digital Storage in Consumer Electronics", Elsevier and Newness 2012.

	SRI INDU COLLEGE OF ENGG & TECH LESSON PLAN (Regulation :R18) Department of Electronics and Communication Engineering	Prepared on Rev1: Page: 1 of 6
	Sub. Code & Title	**R18ECE3273 Consumer Electronics**
	Academic Year: 2020-21	**Year/Sem./Section** **III/II**
	Faculty Name & Designation	**N.Tamilarasan Professor**

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT – I							
I	**Consumer Electronics Fundamentals**					**10**		
1.1	History of Electronic Devices- Vacuum Tubes,	W1			Presentation	01	23/03/21	CO1, L2
1.2	Moors'e law Semiconductor Devices, Diodes	T1	43	48	Presentation	01	24/03/21	CO1,L2
1.3	Rectifiers	T1	56	68	Presentation	01	25/03/21	CO1,L2
1.4	Transistors	T1	181,182,382, 383 & 411-415		Presentation	01	26/03/21	CO1,L2
1.5	Logic Gates	W2,			Presentation	01	30/03/21	CO1,L2
1.6	Combinational Circuits	W3			Presentation	01	31/03/21	CO1,L2
1.7	ADC and DAC	W4			Presentation	01	01/04/21	CO1,L2
1.8	Microprocessors, Microprocessor Vs Microcontrollers	T2	635	639	Presentation	01	03/04/21	CO1,L2
1.9	Microcontrollers in consumer electronics	T2	646	654	Presentation	01	06/04/21	CO1,L2
1.10	Energy management, Intelligent Building Perspective.	W5			Presentation	01	07/04/21	CO1,L2
	Review	**Signature of the HOD/Coordinator**						

Unit/ Item No.	**Topic (s)**	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	**Actual Date of Handled**	**CO/RBT**
	UNIT –II							
II	**Entertainment Electronics**					**13**		
2.1	Construction and working principle of Microphone	T2	21	38	video	02	08/04/21 09/04/21	CO2,L3
2.2	Construction and working principle of Loud speaker,	T2	66	84	video	02	12/04/21 15/04/21	CO2,L3
2.3	AM and FM receiver and stereo	T2	367	375	Black board	02	16/04/21 19/04/21	CO2,L3
2.4	2.1 home theatre, 5.1 home theatre	W7			Black board and Video	01	20/04/21	CO2,L3

	SRI INDU COLLEGE OF ENGG & TECH LESSON PLAN (Regulation :R18) Department of Electronics and Communication Engineering	Prepared on Rev1: Page: 2 of 6
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	Academic Year: 2020-21	**Year/Sem./Section** **III/II**
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Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT – I							
2.5	Display systems: CRT and LCD	T2,	413	417	Black board and Video	02	22/04/21 23/04/21	CO2,L3
2.6	LED and Graphics displays	W6			Black board and Video	02	26/04/21 27/04/21	CO2,L3
2.7	Video Players : DVD and Blue RAY	T3, W8	28	32	Black board and Video n	01	28/04/21	CO2,L3
2.8	Digital Cameras and Camcorders	T3,W9	133	136	Black board and Video n	02	29/04/21 30/04/21	CO2,L3
	Review	**Signature of the HOD/Coordinator**						
	UNIT- III							
III	**Smart Home**					**09**		
3.1	Technology involved in Smart home	W10			Black board	01	3/05/21	CO3,L2
3.2	Home Virtual Assistants- Alexa	W11			Black board	01	4/05/21	CO3,L2
3.3	Google Home	W12			Black board	01	5/05/21	CO3,L2
3.4	Home Security Systems - Intruder Detection, Automated blinds	W13			Black board	02	6/05/21 7/05/21	CO3,L2
3.5	Motion Sensors, Thermal Sensors	W14			presentation	02	7/06/21 8/06/21	CO3,L2
3.6	Image Sensors	W15			presentation	01	9/06/21	CO3,L2
3.7	IR and Water Level Sensors	W16			presentation	01	10/06/21	CO3,L2
	Review	**Signature of the HOD/Coordinator**						
	UNIT-IV							
IV	**Home Appliances**					**8**		
4.1	Home Enablement Systems: RFID Home	W29			Presentation	01	11/06/21	CO4,L4
4.2	Home Enablement Systems: Lighting control	W30	6.11	6.14	Presentation	01	14/06/21	CO4,L4
4.3	Automatic Cleaning Robots	W31	6.30	6.58	Presentation	01	15/06/21	CO4,L4
4.4	Washing Machines	T2,	670	676	Black board	01	16/06/21	CO4,L4

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Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT – I							
4.5	Kitchen Electronics- Microwave	T2	657	668	Presentation	01	17/06/21	CO4,L4
4.7	Dishwasher and Induction Stoves	T2,W18,W19	778	779	Presentation	01	18/06/21	CO4,L4
4.8	Smart Refrigerators and Smart alarms,	T3,	129	131	Presentation	01	21/06/21	CO4,L4
4.9	Smart toilet, Smart floor and Smart locks	W20,W21			Presentation	01	22/06/21	CO4,L4
	Review	**Signature of the HOD/Coordinator**						
	UNIT-V							
V	**Communication Systems**					**14**		
5.1	Cordless Telephones	T2	602	604	Presentation	01	23/06/21	CO5,L6
5.2	Fax Machines	T2	612	615	Presentation	01	24/06/21	CO5,L6
5.3	PDAs- Tablets	T3	125	127	Black board	01	25/06/21	CO5,L6
5.4	Smart Phones	T3	124	125	Black board	01	28/06/21	CO5,L6
5.5	Smart Watches	T3	129	131	Black board	01	29/06/21	CO5,L6
5.6	Introduction to Smart OS.	W22			Presentation	01	30/06/21	CO6,L5
5.7	Android and iOS	W23			Black board	01	01/07/21	CO6,L5
5.8	Video Conferencing Systems- Web/IP Camera	W24			Presentation	01	02/07/21	CO6,L5
5.9	Video security	W25			Presentation	01	05/07/21	CO6,L5
5.10	Internet Enabled Systems Wi-Fi	W26			Presentation	01	06/07/21	CO6,L5
5.12	IoT	W27			Presentation	01	07/07/21	CO6,L5
5.13	Li-Fi	W28			Presentation	01	08/07/21	CO6,L5
5.14	GPS and Tracking Systems,	T3	162	164	Presentation	01	09/07/21	CO6,L5
5.15	Contemporary Topics				Presentation	01	12/07/21	CO6,L5

Unit/ Item No.	Topic (s)	Book Reference	Page (s) From	Page (s) To	Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
	UNIT – I							
	Review	Signature of the HOD/Coordinator						

LIST OF TEXT BOOKS AND REFERENCES

Text Books:

T1. Thomas L Floyd "Electronic Devices" 10th Edition Pearson Education Asia 2018..

T2. Consumer Electronics -S. P. Bali/Pearson

T3. Thomas M. Coughlin, "Digital Storage in Consumer Electronics", Elsevier and Newness 2012

Weblinks

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w-2. https://www.electronics-tutorials.ws/logic/

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w-16. https://robu.in/ir-sensor-working/

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Academic Year: 2020-21		**Year/Sem./Section**	**III/II**
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CONTENT BEYOND THE SYLLABUS

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	USB Drive	To get Knowledge	13/07/21	Dr. N.C. Sendhil kumar	PO1, PO2	PSO1, PSO3
2	ATM	To get Knowledge	14/07/21	Dr. N.C. Sendhil kumar	PO1, PO2	PSO1, PSO3
3	Set-upbox	To get Knowledge	15/07/21	Dr. P. Mugunthan	PO1, PO2	PSO1, PSO3
4	Calculator	To get Knowledge	16/07/21	Dr. P. Mugunthan	PO1, PO2	PSO1, PSO3

ASSIGNMENT

S. No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1	Explain the Working principle and Block diagram of Smart TV.	CO2	T3	03/05/21	13/05/21
2	How audio and video information are stored and retrieved from the DVD player?	CO2	T3	03/05/21	13/05/21
3	How does an image sensor detect and convey information used to make an image	C03	T3	03/05/21	13/05/21
4	Explain the working model of washing machine and also discuss the speed control and measurement.	C04	T2	12/07/21	22/07/21
5	Discuss the importance of GPS and tracking system.	C06	T2	12/07/21	22/07/21

SELF STUDY TOPICS			
S.No.	**Topics**	**Books & Journals**	**Course Outcomes**
1	DTH	T3	C03
2	The Home internet of things	T3	C06

	SRI INDU COLLEGE OF ENGG & TECH **QUESTION BANK** **(Regulation :R18)** **Department of Electronics and Communication Engineering**	**(Regulation :R18)** **Prepared on** **Rev1:** **Page: 1 of 6**

Sub. Code & Title	**R18ECE3273 and Consumer Electronics**		
Academic Year: 2020-21		**Year/Sem.**	**III/II**
Faculty Name & Designation	**Dr. N. Tamilarasan, professor /P PRASHANT Assoc Prof**		

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 5. Creating)

UNIT-1 Consumer Electronics Fundamentals			
	2MARKS QUESTIONS	**BT Level**	**Course Outcome**
1.	What are the applications of diode?	1	CO1
2.	Classify the different types of rectifier	2,4	CO1
3.	Define Moore's law	1	CO1
4	Define combinational circuits	1	CO1
5.	What are the applications of combinational circuits?	1	CO1
6.	How does a transistor act as an amplifier?	1	CO1
7.	Compare transistor and vacuum tubes	2,4	CO5
8	Define integrated circuits	1	CO1
9	Define Microprocessor.	1	CO1
10	Define microcontroller	1	CO1
11	What are the applications of Microprocessor and Microcontroller?	1	CO1
12	What are the advantages of Microcontroller?	1	CO1
13	Distinguish between Microprocessor and Microcontroller	4	CO5
14	List the types of ADC.	1	CO1
15	List the types of DAC	1	CO1
16	List the types of logic circuit	1	CO1
	5 MARKS QUESTIONS		
1.	Explain in detail about the Vacuum tubes and mention its advantages and disadvantages	2	CO6
2.	Discuss the working principles of PN junction diode and mention its applications	6	CO1
3.	How PN junction diode act as a rectifier? Explain the working principles of bridge rectifier	1	CO1
4.	Compare Half wave, full wave and bridge rectifier	2,4	CO6

5.	Classify the types of transistor and Discuss the working principles of BJT	2,4	CO1
6.	Discover the structure and working principles of JFET	4	CO1
7.	Discover the structure and working principle of MOSFET	4	CO1
8	What is the need for Microprocessor? Draw and explain the block diagram of Microprocessor	1	CO1
9	Define Microcontroller and explain the block diagram of Microcontroller	1	CO1
10	Distinguish Microprocessor and Micro controller.	4	CO6
11	Explain any one of the Micro-controlled based system	2	CO6
12	Explain the standard logic gates and universal logic gates with a diagram and its truth table	2	CO6
13	Classify the combinational circuits and discuss any two combinational logic circuits	2	CO1
14	How digital input is converted into analog? Discuss with a relevant diagram	2	CO1
15	How analog input is converted into digital? Discuss with a relevant diagram	2	CO1
16	Explain the energy management in consumer electronics	2	CO6
Unit -II : Entertainment Electronics			
2 MARKS QUESTIONS			
1.	List the types of Microphone.	1	CO2
2.	Compare microphone and loudspeaker.	2,4	CO6
3.	Compare LCD and LED display	2,4	CO6
4.	Define super heterodyne principle	1	CO2
5.	Compare CD, DVD and Blu-ray	2,4,5	CO6
6.	Compare AM and FM receiver	2,4,5	CO6
7.	Compare 2.1 and 5.1 home theatre	2,4,5	CO6
8.	What are the advantages of LED display?	2	CO2
9.	What are the advantages of LCD display?	2	CO2
10.	List the advantages of Blu-ray disc	1	CO2
5 MARKS QUESTIONS			
1	Discover the construction and working principle of LCD.	4	CO2
2.	Discover the construction and working principle of LED Display.	4	CO2

3.	Discover the internal structure and working principles of CRT	4	CO2
4.	How does a LCD Display produce Colour picture? and explain with an appropriate diagram	1	CO2
5.	How the audio and video information are retrieved from DVD?. Discuss it with a neat diagram?	1	CO2
6.	How the images are captured and stored in digital camera?. Discuss with a neat diagram?	1	CO2
7.	Discover the construction and working principles of a loud speaker	4	CO2
8	How does the Microphone convert the acoustic signal to an electrical signal? Explain any two Microphones?	1	CO2
9	How does the loudspeaker convert the electrical signal into sound signal? Discuss with a neat diagram?	1	CO2
10	List the types of Microphone, and explain working principle of the wireless Microphone	1	CO2
11	Explain the characteristics of Mirco phone with relevant diagram	2	CO6
12	Explain the block diagram of super heterodyne receiver.	2	CO6
13	Explain the block diagram of FM receiver	2	CO6
14	Discuss with diagram the need for LPF and HPF in 2.1 home theatre	6	CO2
15	Explain the working principles of 5.1 home theatre with a neat diagram	2	CO6
16	Discuss the principles of Blu-ray disc	6	CO2
17	What is the need for camcorder? Discuss with the diagram	1	CO2
Unit – III : Smart Home			
2 MARKS QUESTIONS			
1.	What are the advantages of home security system	1	CO3
2.	What are the advantages of smart technology	1	CO3
3	What is the role of intruder detection?	1	CO3
4.	Define sensor.	2	CO3
5	List the types of sensor	4	CO3

6.	List the applications of IR sensor	4	CO3
7	List the applications of PIR sensor.	4	CO3
8.	What are the components of image sensor?	1	CO3
9.	Classify the thermal sensor	2,4	CO3
10.	What is the switching level of level indicator?	1	CO3
	5 MARK QUESTIONS		
1.	What is a smart home technology? And discuss its security concern	1	CO3
2	How to work from home as virtual assistant and what are the common service virtual assistants?	1	CO3
3.	How does an Alexa interface the human with machine?	1	CO3
4	Discover the function of home security system? Discuss any two home security systems	4	CO3
5.	Discuss the intruder detection and its importance.	6	CO3
6	How motion sensor detects the moving object? Discuss with a necessary diagram.	1	CO3
7.	List the application of the motion sensor and explain any one application.	4	CO3
8.	List the application of IR sensor also explain the working principle of IR sensor with a relevant diagram.	4	CO3
9.	Discuss any one application of level sensor.	6	CO3
10.	How temperature is measured using thermal sensor? Explain any two thermal sensor.	1	CO3
11	Classify the sensor and explain the working principle of any two sensor	2,4	CO3
12	How does an image sensor detect and convey information used to make an image?	1	CO3
	Unit-IV : Home Appliances		
	2 MARKS QUESTIONS		
1.	What is RFID?How does it work?	1	CO4
2.	What are the basic components of Air conditioning system?	1	CO4
3.	Outline the applications of automatic cleaning robots.	2	CO4

4.	Name the different blocks of microwave oven with their functions	1	CO4
5.	Classify different microwave ovens according to their functions	2	CO4
6.	List any two safety rules to be followed while using microwave oven	2	CO4
7.	What is the frequency of microwaves used in microwave ovens .	1	CO4
8	List the inputs and outputs in an electronic washing machine	1	CO4
	5 MARK QUESTIONS		
1.	Explain the components of air conditioning system?	2	CO4
2.	Develop an block diagram to demonstrate working of domestic refrigerator.	3	CO4
3.	Explain various controls of washing machine	2	CO4
4.	Explain the sequence of operation in a washing machine	1	CO4
5.	Compare Semi and fully automatic washing machine	1	CO4
6.	Compare smart and normal refrigerators	2	CO4
7.	Construct a smart alarm system	3	CO4
8	Organise and model model the different components of microwave oven	3	CO4
9	What are the advantages of microwave cooking	1	CO4
	Unit-V: Communication Systems		
	2 MARKS QUESTIONS		
1.	Explain cordless telephone system?	2	CO5
2.	What does DECT means on cordless phones?	1	CO5
3.	**What is the range of cordless phones?**	1	CO5
4.	**What is a fax machine?**	1	CO5
5.	Explain the concept of smart phones.	2	CO5
6.	Explain the concept of smart watch	2	CO5
7.	Summarize the features of IOS	2	CO5
	5 MARK QUESTIONS		
1.	Analyse the different components of cordless telephone systems	4	CO5

2.	Explain the DECT technology used in cordless phones	2	CO5
3.	Organise the different components of a fax machine	3	CO5
4	Classify the range of cordless telephones	2	CO5
5.	Compare wifi and lifi	2,3	CO5
6.	Categorize different types of smart watches according to its functions	4	CO5
7.	Explain Lifi technology	2	CO5
8	Explain GPS technology	2	CO5