SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE
(AUTONOMOUS)
(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)
UG Programmes CE,CSE,ECE,EEE,IT & ME are Accredited by NBA
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204
Estd:1980

Regulation: R20	

ELECTRONICS AND COMMUNICATION ENGINEERING (Minors)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20ECM101	BASIC ELECTRONICS	II-II	4	3	1	0	30	70	100
B20ECM201	SIGNALS & SYSTEMS	III-I	4	3	1	0	30	70	100
B20ECM301	PRINCIPLES OF COMMUNICATIONS	III-II	4	3	1	0	30	70	100
B20ECM401	BASIC VLSI DESIGN	IV-I	4	3	1	0	30	70	100
B20ECM501	*MOOCS-I	II-II to IV-II	2	--	--	--	--	--	100
B20ECM601	*MOOCS-II	II-II to IV-II	2	--	--	--	--	--	100
		TOTAL	**20**	**12**	**4**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any ELECTRONICS AND COMMUNICATION ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of 8 weeks (2 Credits) courses other than the courses offered need to be taken by prior information to the concern. These courses should be completed between II Year II Semester to IV Year II Semester

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ECM101	**Minors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs**

BASIC ELECTRONICS

(Minors Degree Course in ECE)

Course Objectives:

1.	Principles of semiconductor devices, basic construction, operation & applications of P-N and other special diodes.
2.	Construction and performance of half wave and full wave rectifiers with parametric evaluation.
3.	Fundamental operating characteristics of active elements such as BJT and Junction FET.
4.	Basic operation of MOSFET in n-channel and p-channel along with the biasing mechanism.

Course Outcomes: After completion of the course, the student will be able to

S. No	Outcome	Knowledge level
1.	Interpret the operation of P-N junction and various diodes along with the rectifier circuits.	K2
2.	Illustrate the characteristics of BJT in CE, CB configurations along with biasing.	K3
3.	Interpret the Operation and the characteristics of JFET.	K2
4.	Explain the Operation of a MOSFET along with the basic knowledge of CMOS technology.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Fundamentals of P-N junction Diode and Special diodes:** Open circuited PN junction, breakdown mechanism, Diode current equation (no derivation) V-I characteristics and applications of PN junction diode, Zener diode, LED.
UNIT-II (8 Hrs)	**Rectifier circuits:** Half wave and Full wave rectifiers, PIV, DC voltage and current, ripple factor, efficiency, capacitive filter (without mathematical analysis).
UNIT-III (8 Hrs)	**Fundamentals of Transistors:** Bipolar Junction Transistor (BJT) construction & Basic operation, Active, Cut-off, Saturation modes of operation, CB, CE configurations, Input and Output characteristics, Early effect, Transistor as an Amplifier and a Switch, Comparison of three configurations, Self and fixed biasing.
UNIT-IV (8 Hrs)	**Field effect transistors (FET's) :** Junction Field Effect Transistor (JFET) Operation, n-channel JFET, p-channel JFET, Pinch-off Voltage, Volt-Ampere characteristics, FET biasing, Advantages of FET over BJT, Applications of FET.
UNIT-V	**Metal oxide semiconductor Field effect transistors (MOSFETS) :**

(8 Hrs)	Construction and Operation, Classification of MOSFETS: N-channel(NMOS), P-channel(PMOS) Enhancement and Depletion modes. Biasing the MOSFET, Comparison between BJT,FET and MOSFET. Basics of Complementary Metal oxide semiconductors (CMOS).
Text Books:	
1.	Integrated Electronics: Analog and Digital circuits and systems by Jacob Millman and Christos C.Halkias, Tata MCGraw Hill edition.
2.	Electronic devices and circuits by S.Salivahanan and N.Sureshkumar, Tata MCGraw Hill edition.
Reference Books:	
1.	Electronic Devices and Circuits Theory by Robert L. Boylestad& Louis Nashelsky, PHI edition
2.	Electronic Devices and Circuits by Sanjeev Guptha, DhanapatRai publications.
e-Resources:	
1.	https://books.google.co.in/books?id=Qta8v9hJBMAC&printsec=copyright#v=onepage&q&f=false
2.	https://books.google.co.in/books?id=z5nL2x7Z5X4C&printsec=frontcover&source=gbs_ge_summary_r&hl=en#v=onepage&q&f=false

					Course Code: B20ECM101
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		II B. Tech II Semester MODEL QUESTION PAPER			
		BASIC ELECTRONICS			
		(Minors Degree Course in ECE)			
Time: 3 Hrs					**Max. Marks:70**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain basic operation and V-I characteristics of semiconductor diode?	**1**	**2**	**7**
	b).	What is Zener diode? Explain its operation in reverse bias condition along with its applications?	**1**	**2**	**7**
		OR			
2.	**a).**	Give a brief note on the breakdown mechanism of a diode.	**1**	**2**	**7**
	b).	Explain construction and operation of LED?	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Draw and explain the operation of a full wave rectifier.	**2**	**3**	**7**
	b).	Prove that the rectifier efficiency of a full wave rectifier is twice that of the half wave rectifier.	**2**	**3**	**7**
		OR			
4.	**a).**	Derive the expression for efficiency and ripple factor for a half wave rectifier with capacitive filter.	**2**	**3**	**7**
	b).	Mention the advantages and applications of rectifier circuits.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	Plot the input and output characteristics of transistor in CE configuration?	**2**	**2**	**7**
	b).	Explain different modes of operation of a BJT.	**2**	**2**	**7**
		OR			
6.	**a).**	Explain Common-base configuration of transistor?	**2**	**2**	**7**
	b).	Explain the operation of a BJT in self bias.	**2**	**2**	**7**
		UNIT-IV			
7.	**a).**	Explain the construction and working of a n-channel JFET.	**3**	**2**	**7**
	b).	Write a short note on FET biasing.	**3**	**2**	**7**
		OR			
8.	**a).**	List out the advantages of FET over BJT.	**3**	**2**	**7**
	b).	Write a brief note on the characteristics of a Junction FET.	**3**	**2**	**7**

		UNIT-V			
9.	**a).**	Write a brief note on construction and operation of a MOSFET.	**4**	**2**	**7**
	b).	List out the comparisons between BJT, FET and MOSFET.	**4**	**2**	**7**
		OR			
10.	**a).**	Classify various MOSFET's and Explain them in detail.	**4**	**2**	**7**
	b).	Write a short note on complementary metal oxide semiconductors.	**4**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ECM201	**Minors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs**

SIGNALS AND SYSTEMS

(Minors Degree Course in ECE)

Course Objectives:

1.	To introduce the fundamental concepts and techniques associated with the understanding of signals and systems.
2.	To familiarize with techniques suitable for analyzing continuous-time LTI systems using transforms.
3.	To familiarize with development of the mathematical skills to solve problems involving convolution and sampling.

Course Outcomes: After completion of the course, the student will be able to

S. No	Outcome	Knowledge level
1.	Apply the basic concepts of signals and systems.	K3
2.	Analyze the spectral characteristics of Continuous Time aperiodic signals using Fourier analysis.	K4
3.	Apply Laplace- transforms for analyzing Continuous -time signals and systems.	K3
4.	Apply Z- transforms for analyzing discrete-time signals and systems.	K3
5.	Outline the process of sampling and the effects of under sampling.	K2

SYLLABUS

UNIT-I (8 Hrs)	**Introduction to Continuous –Time and Discrete –Time Signals** Continuous–Time & Discrete–Time signals, Signal Energy and Power, Periodic Signals, Even & odd Signals, Continuous-Time complex Exponential and Sinusoidal Signals, Discrete–Time complex Exponential and Sinusoidal Signals and their Periodicity, The Continuous–Time and Discrete–Time Unit Impulse and Unit step Functions.
UNIT-II (8 Hrs)	**Introduction to Continuous –Time and Discrete –Time Systems** Continuous–Time and Discrete–Time Systems, Operations on signals, Interconnections of Systems, Basic System Properties, Continuous–Time and Discrete Time LTI Systems: The Graphical interpretation of Convolution Integral and The Convolution Sum, Causal LTI Systems Described by Differential and Difference Equations, Singularity Functions.
UNIT-III (8 Hrs)	**Continuous time Fourier Transform** Introduction, Representation of Aperiodic signals, Continuous time Fourier

	Transform, Properties of the continuous time Fourier Transform, Systems characterized by linear constant coefficient differential equations.
UNIT-IV (8 Hrs)	**Laplace Transform** Introduction, The Laplace Transform, Region of convergence for Laplace Transforms, The Inverse Laplace Transform, Properties of Laplace Transforms, The initial and Final value theorems.
UNIT-V (10 Hrs)	**Sampling Theorem and Z-Transform** Introduction to Sampling Theorem, Statement of Sampling Theorem for Low pass signals (Theorem Proof for Low Pass signals only), Discussion on Oversampling, Critical sampling and Under sampling (aliasing), The Z-Transform, The Inverse Z-Transform, Properties of Z-Transform, Initial and Final Value theorems, Some common Z-transform pairs.
Text Books:	
1.	Signals Systems and Communication-B. P. Lathi, BS Publication.
2.	Signals and Systems- Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI, 2ndEdn.
Reference Books:	
1.	Signals and Systems – P.RamakrishnaRao, TMH.
2.	Signals and Systems- A.AnandaKumar,PHI.
e-Resources:	
1.	https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/
2.	https://swayam.gov.in/nd1_noc20_ee06/preview

			Course Code:B20ECM201		
SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)					**R20**
III B. Tech I Semester MODEL QUESTION PAPER					
SIGNALS AND SYSTEMS					
(Minors Degree Course in ECE)					
Time: 3 Hrs					**Max. Marks:70**
Answer **ONE Question** from **EACH UNIT**					
All questions carry equal marks					
Assume suitable data if necessary					
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain all classification of signals with examples for each category.	**1**	**3**	**7**
	b).	Determine the power and RMS value of the following signals. 1. x (t) = 5cos (50t+3), 2. x (t) =10cos (5t)cos f_0(10t)	**1**	**3**	**7**
		OR			
2.	**a).**	Prove the energy of the power signal is infinite over infinite time.	**1**	**3**	**7**
	b).	Find weather the below signals are periodic or not, if periodic find periodicity also. 1.(-1)n 2. Cos 3t u(t)	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Determine whether the following systems are time invariant or not. 1. y(t) = x(t2) 2 . $y\ (n) = x(2n)$	**2**	**2**	**7**
	b).	Find the convolution of the following two discrete time sequences x(n) = {1, 2, 5, 4} and y(n) = {6, 2, 4, 3}.	**2**	**2**	**7**
		OR			
4.	**a).**	Find the convolution of the following two signals. X(t) = u(t) and y(t) = e-atu(t).	**2**	**3**	**7**
	b).	Explain all classification of systems with examples for each category.	**2**	**3**	**7**
		UNIT-III			
5.	**a).**	State and derive time shifting and time scaling Properties of Fourier Transform.	**3**	**3**	**7**
	b).	Find the Fourier transform of the following 1. eatu-t 2. te-atu(t)	**3**	**3**	**7**
		OR			
6.	**a).**	Find the inverse Fourier transform of X(jw) =1/(1+jw)^2	**3**	**3**	**7**

	b).	State and prove the differentiation in the frequency domain property of CTFT	**3**	**3**	**7**
		UNIT-IV			
7.	**a).**	Find the Laplace Transform of xt=te-atu(t)	**4**	**3**	**7**
	b).	State and prove any two properties of the Laplace Transform.	**4**	**3**	**7**
		OR			
8.	**a).**	Compute the initial and final values for xs= 2s+5s(s+3)(s+4)2	**4**	**3**	**7**
	b).	Find the inverse Laplace Transform of XS=logS+5S+6	**4**	**3**	**7**
		UNIT-V			
9.	**a).**	List out the properties of ROC of Z – Transform.	**5**	**3**	**7**
	b).	Find the Z – Transform of the signal 12n-1u(n-1).			
		OR			
10.	**a).**	Find the inverse Z – Transform of 1-aZ-1Z-1-a with ROC Z>1a	**5**	**3**	**7**
	b).	State the Nyquist sampling theorem and discuss about under sampling, critical sampling and over sampling conditions.	**5**	**3**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ECM301	**Minors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs**

PRINCIPLES OF COMMUNICATIONS

(Minors Degree Course in ECE)

Course Objectives:

1.	Familiarize with the fundamental concepts of communication systems and various techniques of analog modulation and demodulation of signals.
2.	To provide a good understanding of the behaviour of analog communications in the presence of noise.
3.	To introduce the elementary concepts of digital communication systems and familiarize with basic techniques of generating and demodulating pulse modulated signals.
4.	To introduce the elementary concepts of digital representation of analog signals.

Course Outcomes: After completion of the course, the student will be able to

S. No	Outcome	Knowledge level
1	Differentiate various amplitude modulation and demodulation schemes and compare the performance of various amplitude modulation techniques in the presence of noise.	K4
2	Differentiate various frequency modulation and demodulation schemes and analyse the performance of frequency modulation technique in the presence of noise.	K4
3	Understand the basic concepts of sampling and differentiate various Pulse modulation and demodulation techniques.	K2
4	Understand the basic concepts of digital representation of analog signals.	K2
5	Understand the concepts of digital modulation techniques.	K2

SYLLABUS

UNIT-I (10 Hrs)	**AMPLITUDE MODULATION**: Introduction, Frequency Translation, Amplitude Modulation, Switching Modulator, Envelope Detector, Double Side Band-Suppressed Carrier Modulation, Ring Modulator, Coherent Detection, Costas Receiver, Quadrature Amplitude Modulation, SSB Modulation, VSB Modulation, Frequency-Division Multiplexing, Noise in DSB-SC Receivers, Noise in AM Receivers.
UNIT-II (8 Hrs)	**ANGLE MODULATION**: Basic Definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission Bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, Phase-Locked Loop FM demodulator. Noise in FM Receivers, FM Threshold Effect, Pre-Emphasis and De-Emphasis in FM.

UNIT-III (8 Hrs)	**PULSE MODULATION**: Introduction, Why digitize analog sources? The Low Pass Sampling Process, Pulse Amplitude Modulation. Time Division Multiplexing, Pulse width Modulation, Pulse-Position Modulation, Generation and Detection of PWM and PPM waves.
UNIT-IV (8 Hrs)	**DIGITAL REPRESENTATION OF ANALOG SIGNAL:** Quantization of signals, Quantization error, Pulse Code Modulation, Companding, T1 Digital system, Differential Pulse Code Modulation, Delta Modulation
UNIT-V (8 Hrs)	**DIGITAL MODULATION AND TRANSMISSION:** Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Binary Frequency Shift-Keying
Text Books:	
1.	**Principles of Communication Systems,** H.Taub&D.L.Schilling, TMH, 2011
2.	**Communication Systems**, Simon Haykins& Moher, 5th Edition, John Willey, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.
Reference Books:	
1.	Modern Digital and Analog Communication Systems, B. P. Lathi, Oxford University Press., 4th edition.
2.	An Introduction to Analog and Digital Communication, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.
3.	Communication Systems, Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.
4.	Communication Systems: Analog and Digital, R.P.Singh and S.Sapre: TMH 2nd edition, 2007.
e-Resources:	
1.	https://nptel.ac.in/courses/117/105/117105143/
2.	https://nptel.ac.in/courses/117/101/117101051/
3.	https://www.tutorialspoint.com/analog_communication/index.htm
4.	https://www.tutorialspoint.com/digital_communication/index.htm

					Course Code: B20ECM301
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B. Tech II Semester MODEL QUESTION PAPER			
		PRINCIPLES OF COMMUNICATIONS			
		(Minors Degree Course in ECE)			
Time: 3 Hrs					**Max. Marks:70**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain the operation of envelope detector with a neat diagram.	**1**	**2**	**7**
	b).	Derive an expression for output signal -to-noise ratio in DSB-SC system.	**1**	**3**	**7**
		OR			
2.	**a).**	Explain the coherent detection of DSB-SC modulated waves.	**1**	**2**	**7**
	b).	Explain vestigial sideband modulation.	**1**	**2**	**7**
		UNIT-II			
3.	**a).**	Define frequency deviation and phase deviation in Frequency Modulation and differentiate between NBFM and WBFM.	**2**	**2**	**7**
	b).	Explain transmission bandwidth of FM Signals	**2**	**2**	**7**
		OR			
4.	**a).**	Draw the block diagram of an Indirect method of FM generation and explain its operation.	**2**	**2**	**7**
	b).	Explain Pre-Emphasis and De-Emphasis.	**2**	**2**	**7**
		UNIT-III			
5.	**a).**	State and prove Nyquist Sampling theorem for low pass signals.	**3**	**2**	**7**
	b).	With neat block schematic diagrams explain the generation and detection of a PAM signal.	**3**	**2**	**7**
		OR			
6.	**a).**	Explain the modulation and demodulation techniques for pulse time modulation systems.	**3**	**2**	**7**
	b).	Explain Time Division Multiplexing.	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Explain about the operation of a PCM system.	**4**	**2**	**7**
	b).	Explain differential pulse code modulation.	**4**	**2**	**7**
		OR			

8.	**a).**	Explain delta modulation (DM) system.	**4**	**2**	**7**
	b).	Explain companding.	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	Explain how a binary signal can be transmitted and received by using a BPSK system.	**5**	**2**	**7**
	b).	Explain the method of generation and recovery of a DPSK signal. What is DEPSK?	**5**	**2**	**7**
		OR			
10.	**a).**	Explain how a binary signal can be transmitted and received by using a BFSK system.	**5**	**2**	**7**
	b).	Explain the role of a QPSK transmitter and receiver in serial data transmission and reception.	**5**	**2**	**7**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20ECM401	**Minors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs**

BASIC VLSI DESIGN

(Minors Degree Course in ECE)

Course Objectives:

1.	To introduce various fabrication steps of MOS transistors and their electrical properties.
2.	To implement the stick diagrams and layouts using CMOS/Bi-CMOS design rules.
3.	To explain MOS technology interconnection as circuits, scaling models, static and dynamic designs.
4.	To introduce Basic FPGA Architecture and testing methods of digital circuits.

Course Outcomes: After completion of the course, the student will be able to

S.No	Outcome	Knowledge Level
1.	Analyze the Electrical properties and Fabrication processes of MOS circuits.	K3
2.	Design the layouts of various MOS circuits by applying the concept of design rules.	K4
3.	Interpret the basic MOS circuit concepts, scaling models and the impact of scaling MOS circuits along with a few static and dynamic CMOS Designs.	K2
4.	Interpret the concepts of FPGA and testing methods of digital circuits.	K2

SYLLABUS

UNIT-I (10Hrs)	**Introduction**: Introduction to IC Technology, Fabrication process: CMOS (NMOS, PMOS), Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance, Output Conductance and Figure of Merit. NMOS Inverter, Pull-up to Pull down Ratio for NMOS inverter driven by another NMOS Inverter, and through one or more pass transistors, The CMOS Inverter, Latch-up in CMOS circuits.
UNIT-II (10 Hrs)	**MOS and Bi-CMOS Circuit Design Processes**: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, CMOS/BiCMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter.
UNIT-III (10 Hrs)	**Basic Circuit Concepts**: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays. **Scaling of MOS Circuits**: Scaling models, Scaling factors for device parameters, Limitations of Scaling on substrate doping.

UNIT-IV (10 Hrs)	**Test and Testability:** Design for Testability, Scan Design Techniques and Built-In-Self Test. **FPGA Based Systems:** Introduction, Basic concepts, FPGA architecture.
UNIT-V (10 Hrs)	**Static CMOS Design:** Complementary CMOS and its static properties, Ratioed logic, Pass Transistor logic- Design of logic gates. **Dynamic CMOS Design:** Basic principles, speed and power dissipation of dynamic logic, Issues in dynamic logic- charge leakage, charge sharing, Static latches and registers- Latches versus registers, The bistability principle.
Textbooks:	
1.	Essentials of VLSI Circuits and Systems By Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited,2005 Edition.
2.	Digital Integrated Circuits, Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic,2nd edition, 2016
Reference Books:	
1.	FPGA Based System Design- Wayne Wolf, Pearson Education, 2004, Technology and Engineering
2.	CMOS Digital Integrated Circuits Analysis and Design, Sung-Mo Kang, Yusuf Leblebici, Tata McGraw Hill Education,2003.
e-Resources	
1.	https://www.engineersgarage.com/vlsi-technology-an-overview/
2.	https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.htm

					Course Code:B20ECM401
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		IV B. Tech. I Semester MODEL QUESTION PAPER			
		BASIC VLSI DESIGN			
		(Minors Degree Course in ECE)			
Time: 3 Hrs					**Max. Marks:70**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain the NMOS fabrication steps with neat diagrams.	**1**	**3**	**7**
	b).	Derive the relation between pull –up tp pull-down ratio for nMOS inverter.	**1**	**3**	**7**
		OR			
2.	**a).**	With neat diagrams explain the process of P-well CMOS Inverter.	**1**	**3**	**7**
	b).	Explain in detail about latch-up in cmos	**1**	**3**	**7**
		UNIT-II			
3.	**a).**	Draw the stick diagrams and layouts for (a) CMOS inverter (b) 3 Input NAND and NOR gates using NMOS Technology	**2**	**4**	**7**
	b).	Define Buried contact, Butting contact and Via contact.	**2**	**4**	**7**
		OR			
4.	**a).**	Sketch λ-based design rules for wires, transistors and contacts.	**2**	**4**	**7**
	b).	Draw the layout diagram for OAI logic using CMOS.	**2**	**4**	**7**
		UNIT-III			
5.	**a).**	What is meant by Delay unit? Estimate NMOS inverter pair delays with relevant example.	**3**	**2**	**10**
	b).	Write a short note on scaling models.	**3**	**2**	**4**
		OR			
6.	**a).**	Draw scaled NMOS transistor and derive all scaling factors for device parameters. Consider Combined V and D scaling model	**3**	**2**	**7**
	b).	Calculate total on resistance of CMOS inverter where $Z_{PU}/Z_{PD}=8/1$	**3**	**2**	**7**
		UNIT-IV			
7.	**a).**	Explain about various Scan design techniques.	**4**	**2**	**10**
	b).	Explain about controllability and observability?	**4**	**2**	**4**
		OR			

8.	**a).**	Explain the Basic FPGA Architecture.	**4**	**2**	**7**
	b).	Write various steps to be followed for test mode in Scan Design Techniques?	**4**	**2**	**7**
		UNIT-V			
9.	**a).**	Explain charge leakage and charge sharing in dynamic logics.	**3**	**2**	**7**
	b).	Give a brief explanation about CMOS Ratioed logic.	**3**	**2**	**7**
		OR			
10.	**a).**	Write a short note on complementary CMOS and its properties.	**3**	**2**	**8**
	b).	Explain Bi-stability principle.	**3**	**2**	**6**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A, B splits or as a single Question for 14 marks