UNITED INSTITUTE OF TECHNOLOGY

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Periyanaickenpalayam, Coimbatore – 641020

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

QUESTION BANK

III YEAR

ODD SEMESTER

ACADEMIC YEAR 2024 – 2025

HoD **ACOE** **PRINCIPAL** **CHAIRMAN**

INDEX

EC3501

WIRELESS COMMUNICATION

UNIT I

THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS

Introduction - Frequency Reuse - Channel Assignment Strategies - Handoff Strategies: Prioritizing Handoffs, Practical Handoff Considerations. Interference and System Capacity: Co-Channel Interference and System Capacity - Channel Planning for Wireless Systems, Adjacent Channel Interference, Power Control for Reducing Interference, Trunking and Grade of Service. Improving Coverage and Capacity in Cellular Systems: Cell Splitting, Sectoring.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define hand off and grade of service.	1	1	2
2.	What is channel assignment? What are the types? What are the techniques used to expand the capacity of cellular system?	1	1	2
3.	What do you mean bycell splitting? What is cell sectoring?	1	1	2
4.	In a cellular network, among a handoff call and a new call, which one is given priority? Why?	1	2	2
5.	Define co-channel reuse ratio. Define co-channel interference.	1	1	2
6.	Write is micro cell zone concept?	1	1	2
7.	How the adjacent channel inference can be mitigated?	1	1	2
8.	What do you mean by forward and reverse channel?	1	1	2
	PART B			
1.	With necessary sketch, explain in handoff mechanism adopted in cellular system. Also provide your understanding on its challenges.	1	2	16
2.	Write short note on (i)Trunking(ii) Grade of service of cell system (iii) cell spliting	1	2	16
3.	Derive an expression to reduce co-channel interference experienced by cell edge user in a 7 cell reuse cellular architecture.	1	2	16
4.	How can capacity of a cellular communication system be improved? Explain any two capacity expansion techniques?	1	2	16

UNIT II

MOBILE RADIO PROPAGATION

Large Scale Path Loss: Introduction to Radio Wave Propagation - Free Space Propagation Model – Three Basic Propagation Mechanism: Reflection – Brewster Angle- Diffraction Scattering. Small Scale Fading and Multipath: Small Scale Multipath Propagation, Factors Influencing Small-Scale Fading, Doppler Shift, Coherence Bandwidth, Doppler Spread and Cherence Time. Types of Small- Scale Fading: Fading Effects due to Multipath Time Delay Spread, Fading Effects due to Doppler Spread.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Wha tis Friis free space propagation model?	2	1	2
2.	Define mean excess delay and rms delay spread.	2	1	2
3.	What is meant by multi path propagation?	2	1	2
4.	Define EIRP	2	1	2
5.	Compare small and large scale fading.	2	2	2
6.	Explain received power of aTwo Ray ground reflection model.	2	2	2
7.	Define Coherence time, Doppler shift & Doppler spread.	2	1	2
8.	What are the major advantages of wireless communication?	2	1	2
	PART B			
1.	What you mean by pathloss model? Explain in detail about log-distance path loss model.	2	2	16
2.	Derive free space propagation model and discuss the understanding on propagation mechanism influencing fading in wireless channels.	2	2	16
3.	Describe small scale fading and derive expressions for parameters of mobile multipath channels.	2	2	16
4.	On what basis fading is classified into small and large scale? Discuss the fading effect caused due to multipath time delay and doppler spread?	2	2	16

UNIT III

MODULATION TECHNIQUES AND EQUALIZATION AND DIVERSITY

Digital Modulation – An Overview: Factors that Influence the Choice of Digital Modulation, Linear Modulation Techniques: Minimum Shift Keying (MSK), Gaussian Minimum Shift Keying (GMSK), Spread Spectrum Modulation Techniques: Pseudo- Noise (PN) Sequences, Direct Sequence Spread Spectrum (DS-SS)- Modulation Performance in Fading and Multipath Channels- Equalization, Diversity and Channel Coding: Introduction-Fundamentals of Equalization- Diversity Techniques: Practical Space Diversity Considerations, Polarization Diversity, Frequency Diversity, Time Diversity.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Find the 3 dB bandwidth of a Gaussian low pass filter used to produce 0.25 GMSK with a channel data rate of Rb = 270 kbps. What is the 90% power bandwidth in the RF channel? Specify the Gaussian filter parameter.	3	2	2
2.	Write the applications of MFSK and OFDM.	3	1	2
3.	Distinguish between diversity gain versus array gain.	3	2	2
4.	What is the need of equalization in wireless communication?	3	1	2
5.	What is the function of selection and combining diversity?What is Macro diversity?	3	1	2
6.	What is the Meaning of the word jamming and anti-jam? What is jamming margin?	3	1	2
7.	How the PN sequence can be generated?	3	1	2
8.	Differentiate micro from macro diversity.	3	2	2
	PART B			
1.	Describe in detail abouti) Linear equalizers ii)Non-linear equalizers.	3	2	16
2.	Discuss your understanding on diversity techniques. Also compare and contrast it with respect to equalization techniques.	3	2	16
3.	Explain the generation of PN sequences and its properties.	3	2	16
4.	Explain the operational mechanism and transmitter and receiver implementation of GMSK.	3	2	16

UNIT IV

MULTIPLE ACCESS TECHNIQUES

Introduction: Introduction to Multiple Access- Frequency Division Multiple Access (FDMA) – Time Division Multiple Access (TDMA)- Spread Spectrum Multiple Access-Code Division Multiple Access (CDMA)- Space Division Multiple Access (SDMA)- Capacity of Cellular Systems: Capacity of Cellular CDMA, Capacity of CDMA with Multiple Cells.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	In 3G cellular communication, what type of multiple access technique is used?	4	2	2
2.	What do you mean by forward and reverse channel?	4	1	2
3.	What is the significance of multiple access techniques?	4	1	2
4.	What is cyclic prefix?	4	1	2
5.	Define capacity of the cellular system.	4	1	2
6.	Mention the features of SDMA.	4	1	2
7.	Write any three features of FDMA.	4	1	2
8.	How FDMA handles near-far problem?	4	1	2
	PART B			
1.	Explain in detail about the TDMA technique and compare with FDMA efficiency and implementation.	4	2	16
2.	Explain the working principle of CDMA system. Also derive the capacity of CDMA scheme with multiple cells in cellular system.	4	2	16
3.	With relevant sketch, explain the operation of multiple access technique used in 2G cellular system. Also derive the expression to compute capacity of TDMA scheme.	4	2	16
4.	Calculate channel capacity of TDMA, FDMA ,and CDMA in cell system.	4	2	16

UNIT V

WIRELESS NETWORKING

Introduction: Difference between Wireless and Fixed Telephone Networks, The Public Switched Telephone Network (PSTN), Development of Wireless Networks: First Generation Wireless Networks, Second Generation Wireless Networks, Third Generation Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks: Circuit Switching, Packet Switching- Personal Communication Services/ Networks (PCS/PCNs): Packet Vs Circuit Switching for PCN, Cellular Packet- Switched Architecture- Packet Reservation Multiple Access (PRMA)- Network Databases: Distributed Database for Mobility Management- Universal Mobile Telecommunication Systems (UMTS).

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Give the functions of PSTN.	5	1	2
2.	State the difference between wired and wireless telephone system.	5	2	2
3.	Define AMPS and GSM.	5	1	2
4.	Define PRMA and UMTS.	5	1	2
5.	State the difference between circuit and packet switching.	5	2	2
6.	What do you mean by connection oriented services?	5	1	2
7.	What do you mean by MAHO?	5	1	2
8.	List the capabilities of third generation systems.	5	1	2
	PART B			
1.	Explain the working mechanism of UMTS.	5	2	16
2.	Draw the schematic diagram of PSTN and explain in detail.	5	2	16
3.	With neat diagram and explain in detail about the PCS / PCNs	5	2	16
4.	Provide your understanding on evolution of wireless networks.	5	2	16

END

EC3551

VLSI AND CHIP DESIGN

UNIT I

MOS TRANSISTOR PRINCIPLES

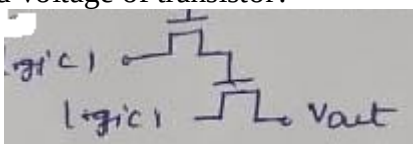
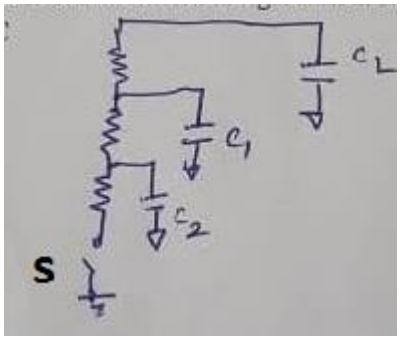
MOS logic families (NMOS and CMOS), Ideal and Non Ideal IV Characteristics, CMOS devices.MOS(FET) Transistor Characteristic under Static and Dynamic Conditions, Technology Scaling, power consumption

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is body effect?	1	1	2
2.	By what factor gate capacitance must be scaled if constant electric field scaling applied?	1	1	2
3.	Why NMOS devices conduct strong 0 and weak 1?	1	1	2
4.	How does MOSFET act as switch?	1	1	2
5.	Draw stick diagram of 2 input NAND gate	1	1	2
6.	Why NMOS devices conduct strong 0 and weak 1?	1	2	2
7.	List the sources of power dissipation in CMOS circuits	1	1	2
8.	What is the disadvantage of pass transistor logic?	1	1	2
	PART B			
1.	Derive the expression for current in cut-off , Linear , saturation region in Long channel I-V characteristics.	1	3	16
2.	Enumerate Non Ideal I – V characteristics or second order effects of MOS transistor.	1	2	16
3.	Explain Scaling and advantage of scaling and various scaling technique.	1	4	16
4.	Explain the DC transfer characteristics of a CMOS Inverter with necessary conditions for the different regions of operation.	1	4	16

UNIT II

COMBINATIONAL LOGIC CIRCUITS

Propagation Delays, stick diagram, Layout diagrams, Examples of combinational logic design, Elmore's constant, Static Logic Gates, Dynamic Logic Gates, Pass Transistor Logic, Power Dissipation, Low Power Design principles.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	**C**ompare Static and Dynamic logic circuits.	2	1	2
2.	Draw 2 input NOR gate using pass transistor logic	2	2	2
3.	What is the value of V_{out} for the fig shown below, where V_{tn} is the threshold voltage of transistor? 	2	1	2
4.	Define sub threshold conduction.	2	1	2
5.	Compare Static and Dynamic logic circuits.	2	1	2
6.	Draw 2 input NOR gate using pass transistor logic	2	2	2
7.	Find Discharging time of circuit shown in figure when switch 'A' is closed let $C_L = C_1 = C_2 = C$ 	2	1	2
8.	Define Elmore's constant.	2	1	2
	PART B			
1.	Discuss design techniques that are used for reducing static power dissipation and leakage.	2	4	16
2.	Write Lambda based Layout design rules and Sketch a static CMOS gate and stick diagram computing Y= [(A+B+C).D]	2	2	16

	calculate area required .			
3.	Derive an expression for Rise time, fall time and propagation delay for CMOS Inverter.	2	3	16
4.	Discuss Power dissipation and dynamic power design principles in detail.	2	4	16

UNIT III

SEQUENTIAL LOGIC CIRCUITS AND CLOCKING STRATEGIES

Static Latches and Registers, Dynamic Latches and Registers, Pipelines, Non bistable Sequential Circuits. Timing classification of Digital Systems, Synchronous Design, Self-Timed Circuit Design.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Differentiate Latches and registers.	3	1	2
2.	What is Timing classification of Digital Systems?	3	1	2
3.	List the various interconnect parameters analysed in VLSI chip design.	3	1	2
4.	What is meant by bistability?	3	1	2
5.	Write the operation of C^2MOS register.	3	1	2
6.	Interpret True Single – Phase clocked register.	3	2	2
7.	Explain the working of Dynamic positive edge – triggered register when clock = 0.	3	2	2
8.	Mention the advantage of pipelined operation.	3	1	2
	PART B			
1.	Explain in detail Synchronous Interconnect, Mesochronous Interconnect, Plesiochronous interconnect, Asynchronous Interconnect.	3	4	16
2.	(i)Discuss the Mono stable multivibrator using CMOS transistor and explain the operation.	3	4	8
	(ii)Discuss the true single phase clock register	3	4	8

3.	(i)Explain the Multiplexer based latches and master slave edge triggered register.	3	3	8
	(ii) What is pipelining? Apply pipelining concept and Determine the total clock time required for obtaining the output for $y = \lvert a_n + b_n \rvert$. where n = 1,2,3,4.	3	3	8
4.	Illustrate the combined effect of clock skew and Jitter in sequential logic circuit and find the time period of the clock.	3	3	16

UNIT IV

INTERCONNECT , MEMORY ARCHITECTURE AND ARITHMETIC CIRCUITS

Interconnect Parameters – Capacitance, Resistance, and Inductance, Electrical Wire Models, Sequential digital circuits: adders, multipliers, comparators, shift registers. Logic Implementation using Programmable Devices (ROM, PLA, FPGA), Memory Architecture and Building Blocks, Memory Core and Memory Peripherals Circuitry

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Write the logic equation for the 3-bit magnitude comparator.	4	1	2
2.	Find Propagation delay for n bit carry select adder.	4	1	2
3.	Give the application of high speed adder.	4	1	2
4.	Sketch 1- transistor dynamic RAM cell.	4	2	2
5.	Develop Half adder circuit using ROM.	4	1	2
6.	Define Braun multiplier.	4	1	2
7.	Why we go to Booth's algorithm?	4	1	2
8.	List the different types of shifter.	4	1	2
	PART B			
1.	(i)Write the design techniques in dealing with capacitive cross talk.	4	4	8
	(ii)Describe the design techniques available to the designer to address the voltage drop over the inductor problem.	4	4	8
2.	(i)Realize the combinational function with PLA. $Y1 = \sum m(2,3,4,6)$ $Y2 = \sum m(1,2,3,4)$ (ii)Elucidate the basic architecture of FPGA.	4	5	16
3.	What is the need of carry save adder? Explain the 4-bit carry save adder.	4	4	16

4.	What is the Array multiplier? show how array multiplier uses an array of cells for computing the result.	4	4	16

UNIT V

ASIC DESIGN AND TESTING

Introduction to wafer to chip fabrication process flow. Microchip design process & issues in test and verification of complex chips, embedded cores and SOCs, Fault models, Test coding. ASIC Design Flow, Introduction to ASICs, Introduction to test benches, Writing test benches in Verilog HDL, Automatic test pattern generation, Design for testability, Scan design: Test interface and boundary scan.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	List the issues in testing microchip design process.	5	1	2
2.	What is the significance of FPGA?	5	1	2
3.	What are the various types of ASICs?	5	1	2
4.	Differentiate FPGA design and ASIC design flow.	5	1	2
5.	Write the test bench in Verilog HDL to test the D flip flop.	5	1	2
6.	What are the fault models.	5	1	2
7.	What is meant by CBIC?	5	1	2
8.	Name the elements in a configurable logic block.	5	1	2
	PART B			
1.	Explain the BIST architecture with neat diagram and explain how LFSR used as test pattern generator ?	5	4	16
2.	(i)Describe boundary scan with necessary diagrams.	5	4	8
	(ii)Explain the automatic test pattern generation with suitable example.	5	4	8
3.	(i)Write the test bench in verilog HDL for combinational circuit.	5	4	8
	(ii)Explain the Test interface and Boundary Scan suitable for Scan design.	5	4	8
4.	(i)Generate the test vectors for the combinational function F = (AB+BC+CD) using automatic test pattern generation for the Struck at 0 fault at node B.	5	5	8
	(ii)Explain the automatic test pattern generation with suitable example.	5	5	8

*****END*****

EC3551

TRANSMISSION LINES AND RF SYSTEMS

UNIT I

TRANSMISSION LINE THEORY

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion less line - Loading and different methods of loading - Line not terminated in Z 0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the important properties of infinite line	1	1	2
2.	What is the significance of Reflection coefficient?	1	1	2
3.	What is a distortion less line? What is the condition for a distortion less line?	1	1	2
4.	A transmission line has Zo = 745∠-12° Ω and is terminated in ZR=100Ω. Calculate reflection factor	1	2	2
5.	A transmission line has a characteristic impedance of 400 Ω and is terminated by a load impedance of (650-j475) Ω. Determine the reflection coefficient	1	2	2
6.	Define reflection coefficient	1	1	2
7.	Define characteristic impedance	1	1	2
8.	How to avoid the frequency distortion that occurs in the line? Define characteristic impedance	1	1	2
	PART B			
1.	Construct voltage and current equation of a transmission line. Derive its general solution. Also discuss the physical significance of line equations.	1	2	16
2.	i. Derive the attenuation and phase constant of a transmission line in terms of R,L,G,C	1	3	8
	ii. Explain in detail about waveform distortion and also derive the condition for minimum attenuation in a distortion less line	1	3	8
3.	What is loading? What are the different types of loading	1	2	16
4.	Derive the expression of input impedance of zero short and open circuit impedance	1	3	16

5	A generator of 1V, 1KHz, supplies power to a 100 Km open wire line terminated in 200 Ω resistance. The line parameters are R = 10 Ω/Km, L = 3.8mH/Km, G =1x10-6 mho/Km, C = 0.0085 μF/Km. Calculate Zo, α, β, λ, v. also find the received power.	1	2	16

UNIT II

HIGH FREQUENCY TRANSMISSION LINES

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What are the assumptions to simplify the analysis of line performance at high frequencies?	2	1	2
2.	What are standing waves?	2	1	2
3.	What is the value of SWR for open circuit, short circuit and matched line?	2	1	2
4.	A lossless transmission line has a shunt capacitance of 100pF/m and a series inductance of 4mH /m. Determine the characteristic impedance	2	2	2
5.	State the values of α and β for the dissipation less line	2	1	2
6.	What is zero dissipation line/dissipation less line?	2	1	2
7.	At a frequency of 80 MHz, a lossless transmission line has a characteristic impedance of 300 ohms and a wavelength of 2.5m. Find L and C	2	2	2
8.	Define the term SWR	2	2	2
	PART B			
1.	Explain in detail about the principle of measurement of VSWR, Power and wavelength for high-frequency transmission lines.	2	2	16
2.	Derive the expression of input impedance of a dissipation less line. Also derive the input impedance expression for open and short circuited line.	2	2	16

3.	What are the constants of a lossless line? Write the voltage and current equation	2	2	16
4.	i. Characteristic impedance of a transmission line at 8 MHz is (40-2j) ohm and the propagation constant is (0.01+j0.18) per meter. Find the primary constants. ii. A line with zero dissipation has R=0.006 ohm per m, C=4.45 pF per m, L=2.5μH per m. If the line is operated at 10MHz, find Ro, α, β, λ, v.	2	3	16

UNIT III

IMPEDANCE MATCHING IN HIGH FREQUENCY LINE

Impedance matching: Quarter wave transformer ,One Eighth wave line, Half wave line- Impedance matching by stubs- Single stub and double stub matching - Smith chart – Application of Smith chart, Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is meant by electrical length of the line?	3	1	2
2.	Why is the quarter wave line called as copper insulator?	3	2	2
3.	Why is a quarter wave lines called as impendence inverter?	3	2	2
4.	Write the procedure to find the impedance from the given admittance using smith chart	3	1	2
5.	Distinguish between single and double stub matching	3	2	2
6.	Mention the significance of Quarter wave line	3	1	2
7.	Tell about impendence matching using stub.	3	1	2
8.	Write application of Smith Chart	3	1	2
	PART B			
1.	A 300Ω transmission line connected to a load impedance of (450-j 600Ω) at 10 MHZ. Identify the Location and Length of the short circuited stub to match the line using Smith chart.	3	3	16
2.	VSWR of a lossless line is found to be 5 and successive voltage minima are 40cm apart. The first voltage minima is	3	3	16

	observed to be 15cm from the load. The length of the line is 160cm and Zo is 300 Ω. Apply the values in smith chart to find the load impedance and input impedance			
3.	Discuss the principles of Quarter wave transformer and double stub matching.	3	3	16
4.	Using smith chart, calculate the length of two short circuit stubs connected in parallel with the line which has normalized load admittance of 0.4-j1.2 mho.	3	3	16

UNIT IV

WAVEGUIDES

Waves between parallel planes of perfect conductors- Transverse Electric waves and Transverse Magnetic waves, Characteristics of TE and TM waves, Transverse Electromagnetic waves, TM and TE waves in Rectangular waveguides, TM and TE waves in Circular waveguides.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define dominant mode. What is the dominant mode of rectangular waveguide?	4	1	2
2.	Why TM01 and TM10 modes in a rectangular waveguide do not exist	4	2	2
3.	Why is TM01 mode preferred to the TE01 mode in a circular waveguide?	4	2	2
4.	Deduce the expression for cut off frequency when the wave is propagated in between two parallel plates.	4	1	2
5.	Mention the characteristics of TEM waves	4	1	2
6.	Mention the applications of circular waveguides	4	1	2
7.	Mention the applications of Rectangular waveguides	4	1	2
8.	Write the expression for resonant frequency for a rectangular resonator	4	1	2
	PART B			
1.	Illustrate the expression for transmission of TE & TM waves between parallel planes.	4		16
2.	Extend the expression for transmission of TM waves inside	4		16

	the rectangular waveguide.			
3.	Extend the expression for transmission of TE waves inside the rectangular waveguide.	4		16
4.	Derive the field components of TE waves of a Circular waveguide.	4		16

UNIT V

RF SYSTEM DESIGN CONCEPTS

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors, Fundamentals of MMIC, Basic concepts of RF design: Filters, couplers, power dividers, Amplifier power relations, Low noise amplifiers, Power amplifiers.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Why is S-matrix used in RF/Microwave analysis?	5	2	2
2.	List RF/Microwave Applications.	5	1	2
3.	Why amplifier design at RF differ significantly from the conventional low frequency approach?	5	2	2
4.	What are the advantages of S parameter at high RF/microwave frequencies?	5	1	2
5.	Define BARITT diode	5	1	2
6.	Compare the enhancement PN junction and Schotty Diode	5	2	2
7.	Mention the requirements and applications of low noise amplifiers	5	1	2
8.	Define inter modulation distortion	5	1	2
	PART B			
1.	Explain the operation of RF Field Effect Transistors.	5	2	16
2.	Explain in detail about Low Noise Amplifiers and Power Amplifiers with suitable diagrams	5	2	16
3.	Explain the operation of voltage controlled oscillator and mixers in details	5	2	16
4.	With neat diagrams explain the structure, operation and types of FET and of BJT.	5	2	16

*****END*****

CCS 338

COMPUTER VISION

UNIT I

INTRODUCTION TO IMAGE FORMATION AND PROCESSING

Computer Vision - Geometric primitives and transformations - Photometric image formation – The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Write the suitable operators used for band pass and steerable filters.	1	1	2
2.	List out the most common morphological operators used image processing.	1	1	2
3.	List out the Fourier transform pairs of some commonly occurring filters and signals.	1	1	2
4.	Define interpolation and decimation. Name the suitable filter used for these two operations.	1	1	2
5.	Define pyramids.	1	1	2
6.	List out the different transformation techniques and its preserved properties.	1	1	2
7.	Define MIP mapping.	1	1	2
8.	Image Deblocking.	1	1	2
	PART B			
1.	Explain the working principal of Digital camera with neat block diagram and also briefly discuss about sampling and aliasing process.	1	2	16
2.	Explain briefly about need of Fourier transform and wiener filtering technique in image processing	1	2	16
3.	Write Short notes on i) Point operators ii) Neighbourhood operators	1	2	16
4.	Write in detail about use of image pyramids and its implementation.	1	2	16

UNIT II

FEATURE DETECTION, MATCHING AND SEGMENTATION

Points and patches - Edges - Lines - Segmentation - Active contours - Split and merge - Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define Image Gradient.	2	1	2
2.	Define Whitening.	2	1	2
3.	Give the significance of Vanishing points in line detection process.	2	1	2
4.	Define Snakes?	2	1	2
5.	Define catchment basins?	2	1	2
6.	What is adaptive non maximal suppression?	2	1	2
7.	What is multi scale oriented patched?	2	1	2
8.	What is affine invariance?	2	1	2
	PART B			
1.	Explain in detail about split and merge image segmentation techniques.	2	2	16
2.	Explain in detail about mean shift and mode findings.	2	2	16
3.	Discuss in detail about Normalized cut segmentation techniques.	2	2	16
4.	Explain in detail about graph cuts and energy based segmentation models.	2	2	16

UNIT III

FEATURE-BASED ALIGNMENT & MOTION ESTIMATION

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion – Optical flow - Layered motion.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is video stabilization	3	1	2
2.	What is De-interlacing?	3	1	2
3.	Define optic flow.	3	1	2
4.	What is meant by a pose?	3	1	2
5.	What could cause uncorrelated estimates of pose? How can this issue be handled?	3	1	2
6.	Differentiate pose consistency and pose clustering.	3	2	2
7.	List the global parametric transforms with matrix for 2D and 3D alignments.	3	1	2
8.	What is panography?	3	1	2
	PART B			
1.	Explain in detail about the following Motion based alignment techniques. i) Spline and layered motion. ii) Optical flow motion.	3	2	16
2.	Explain in detail about linear and iterative algorithms used for pose estimation.	3	2	16
3.	Explain briefly about the various techniques used in geomentric intrinsic calibration.	3	2	16
4.	Discuss in detail about the following feature based alignment techniques. i) Trinangulation techniques. ii) Factorization techniques.	3	2	16

UNIT IV

3D RECONSTRUCTION

Shape from X - Active range finding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define the term “shape from shading”.	4	1	2

2.	Compare BRDF and SVBRDF.	4	2	2
3.	What is an implicit surface?	4	1	2
4.	Write about point based representation in 3D image reconstruction.	4	1	2
5.	What are distance measures? State any two properties of a similarity measure. Mention any two examples for dissimilarity measures, with equations.	4	1	2
6.	Define radiational filters.	4	1	2
7.	Define active range findings.	4	1	2
8.	Define scattered data interpolation.	4	1	2

PART B

1.	Explain in detail about the various shape extraction techniques used in 3D image reconstruction process.	4	2	16
2.	Explain in detail about the surface and point based representation techniques used in 3D reconstruction process.	4	2	16
3.	Explain in the concept of model based 3D reconstruction process in detail.	4	2	16
4.	Explain in detail about the following 3D reconstruction techniques. i) Volumetric representation. ii) Active range findings.	4	2	16

UNIT V

IMAGE-BASED RENDERING AND RECOGNITION

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

Q.No	Question	CO	BTL	Marks

PART A

1.	Define sprites and layers.	5	1	2
2.	What is a video texture?	5	1	2
3.	Define SVM	5	1	2
4.	Define view interpolation.	5	1	2
5.	Write about photo tourism.	5	1	2

6.	Draw the layered depth map images.	5	1	2
7.	Write about light fileds and lumigraphs.	5	1	2
8.	What is unstructured lumigraphs?	5	1	2

PART B

1.	Explain in detail about the following concepts in image based rendering process. i) layered depth images. ii) Light fields and lumigraphs.	5	2	16
2.	Explain in detail about environment mattes techniques used in image rendering process.	5	2	16
3.	Explain in detail about the following concepts in image based rendering process. i) View interpolation ii) Light fields and lumigraphs.	5	2	16
4.	Explain various concepts used in video based rendering process.	5	2	16

*****END*****

CEC 352

SATELLITE COMMUNICATION

UNIT I

SATELLITE ORBITS

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits–Look Angle Determination- Limits of visibility – eclipseSubsatellite point–Sun transit outage-Launching Procedures-launch vehicles and propulsion.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State Kepler's second law of planetary motion.	1	2	2
2.	Explain ascending node & descending node.	1	1	2
3.	Identify the launching stages of satellite with example.	1	1	2
4.	State the purpose of Station keeping.	1	1	2
5.	Identify the basic factors affecting satellite position.	1	1	2
6.	Differentiate geostationary and geosynchronous satellite.	1	2	2
7.	Differentiate Apogee and Perigee.	1	2	2
8.	Define the Kepler's First law for planetary motion.	1	1	2
	PART B			
1.	(i) Express the first two Kepler's laws of planetary motion with suitable diagrams. (ii)Estimate the suitable equations for azimuth angle and location of geostationary satellite.	1	4	16
2.	Describe the orbital parameters in detail.	1	2	16
3.	(i)Show the different applications & different services provided by satellite services. (ii) Illustrate the Kepler's third law of planetary motion.	1	3	16
4.	Solve the limits of visibility for an earth station situated at mean sea level,at latitude 48.42 degrees north, and longitude 89.26 degrees west. Assume a minimum angle of elevation of 10deg.	1	4	16

UNIT II

SPACE SEGMENT

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The antenna sub system.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define satellite and its applications.	2	1	2
2.	Explain the essential of thermal control segment for a spacecraft.	2	2	2
3.	Differentiate split body stabilization with spin stabilization satellite.	2	2	2
4.	What is meant by transponder?	2	1	2
5.	Explain the uplink & downlink frequencies of a satellite.	2	1	2
6.	Describe the materials used for making the satellites.	2	2	2
7.	Define noise temperature is a useful concept in communication receiver.	2	1	2
8.	State the term propellant and its types.	2	1	2
	PART B			
1.	Explain the communication payload and supporting subsystems used in satellite.	2	2	16
2.	Explain the altitude and orbit control system is achieved through spin stabilization systems? Give necessary diagrams.	2	2	16
3.	What are the various elements used in the space segments of a satellite system? Explain the need and function of each element in the satellite system.	2	2	16
4.	Explain Telemetry, Tracking and Command system with suitable diagrams.	2	2	16

UNIT III

SATELLITE LINK DESIGN

Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionosphere characteristics, Link Design with and without frequency reuse

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Write the equation of link budget.	3	1	2
2.	State the basic requirements of an earth station antenna.	3	1	2
3.	Write the equation of link budget.	3	1	2
4.	List the ionospheric effects on space link.	3	1	2
5.	Describe the path loss in wireless communication.	3	1	2
6.	Draw and explain antenna misalignment losses.	3	2	2
7.	A satellite downlink at 12GHz operates with a transmit power of 6w and an antenna gain of 48.2dB. Calculate the EIRP in dBW.	3	2	2
8.	Define Carrier to noise ratio and the earth station parameters affecting it.	3	1	2
	PART B			
1.	Explain about free space transmission losses and express the received power in unit of dBW.	3	2	16
2.	Explain the effects of ionosphere in satellite communication.	3	2	10
3.	Draw the power flow diagram and explain combined uplink and downlink communication.	3	2	16
4.	Explain the following in detail: (i) Uplink rain-fade margin, (ii)Downlink rain-fade margin,	3	2	16

UNIT IV

SATELLITE ACCESS AND CODING METHODS

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system,Digital video Broad cast, multiple access: FDMA,TDMA,CDMA,DAMA Assignment Methods, compression –encryption, Coding Schemes.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	What is a single mode of operation?	4	1	2
2.	What are the methods of multiple access techniques?	4	1	2
3.	What is CDMA?	4	1	2
4.	Give the types of CDMA.	4	1	2
5.	What are the advantages of TDMA over FDMA?	4	1	2
6.	What is preamble?	4	1	2
7.	Define guard time.	4	1	2
8.	What are the types of digital speech interpolation?	4	1	2
	PART B			
1.	Explain the principle behind spectrum spreading and dispreading and how this is used to minimize interference in a CDMA system	4	2	16
2.	Explain in detail about compression and encryption techniques used in satellite communication.	4	2	10
3.	In detail explain about the time division multiplexing and bandwidth requirements in a satellite transmission system.	4	2	16
4.	Describe the ways in which demand assignment may be carried out in an FDMA network.	4	2	16

UNIT V
SATELLITE APPLICATION

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO,MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Give the 3 different types of applications with respect to satellite systems.	5	1	2
2.	Write the principle behind DTH and GPS	5	1	2
3.	Write the principle behind DTH and GPS. What is DBS? Name any two services	5	1	2
4.	Write about bit rates for digital television.	5	1	2
5.	What is INMARSAT?	5	1	2
6.	Mention the services of INSAT.	5	1	2
7.	Write any two features of GPS.	5	1	2
8.	What is the difference between active and passive satellites?	5	1	2
	PART B			
1.	Describe the operation of typical VSAT system. State briefly where VSAT system find widest application.	5	2	16
2.	Explain about LEO, MEO & GEO.	5	2	16
3.	Describe on the satellite navigational system.	5	2	16
4.	(i) Explain the concept behind DTH. (ii) Write in detail about the features of GPS.	5	2	16

*****END*****

CEC345
OPTICAL COMMUNICATION & NETWORKS

UNIT I

INTRODUCTION TO OPTICAL FIBER COMMUNICATION

Introduction - The General Systems - Advantages of Optical Fiber Communication- Ray Theory Transmission: Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays - Electromagnetic Mode Theory for Optical Propagation: Modes in a Planar Guide, Phase and group velocity - Cylindrical Fiber: Step index fibres, Graded index fibers - Single mode fibers: Cutoff wavelength.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define acceptance angle & numerical aperture.	1	1	2
2.	What are the conditions for the single mode propagation?	1	1	2
3.	What do you understand by phase and group velocity?	1	1	2
4.	Distinguish meridional rays from skew rays.	1	1	2
5.	What is the necessity of cladding for an optical fiber?	1	1	2
6.	State Snell's law.	1	1	2
7.	What are the conditions for light to be propagation inside a fiber?	1	1	2
8.	What are the advantages and disadvantage of multimode fiber**?**	1	1	2
	PART B			
1.	(i) Draw a neat diagram and explain the ray theory behind the optical fiber communication with a special mention about the total internal reflection, Acceptance angle and Numerical aperture.	1	2	8
	(ii) Draw and explain the refractive index profile and ray transmission in single mode and multimode step index fibers and graded index fibers. Write the expressions for the numerical aperture and number of guided modes for a graded index fiber.	1	2	8
2.	(i)Derive expression for the linearly polarized modes in optical fibers and obtain the equation for V number.	1	2	8
	(ii) Compare the structure and characteristics of step index and graded index fiber.	1	2	8
3.	(i)With the neat block diagram, explain the fundamental blocks of optical fiber communication.	1	4	8
	(ii) Find the core radius necessary for single mode operation at 1320 nm of a step index fiber with n_1 = 1.48 and	1	4	8

	n_2 = 1.478. Determine the numerical aperture and acceptance angle of this fiber.			
4.	(i)With diagram, explain electromagnetic mode theory of optical propagation. (ii) Describe and derive modes in planar guide.	1	2	16

UNIT II

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS

Attenuation - Material absorption losses in silica glass fibers: Intrinsic absorption, Extrinsic absorption - Linear scattering losses: Rayleigh Scattering, Mie Scattering -Nonlinear scattering losses: Stimulated Brillouin Scattering, Stimulated Raman Scattering – Fiber Bend Loss – Dispersion- Chromatic dispersion: Material dispersion, Waveguide dispersion- Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define attenuation.	2	1	2
2.	What do you mean by Polarization Mode Dispersion?	2	1	2
3.	What are bending loss? Name any two types?	2	1	2
4.	Mention the two causes of intra-modal dispersion.	2	2	2
5.	Distinguish dispersion shifted and dispersion flattened fibers.	2	2	2
6.	What are bending loss? Name any two types?	2	1	2
7.	Define group velocity dispersion	2	1	2
8.	What factors cause Rayleigh scattering in optical fibers?	2	1	2
	PART B			
1.	In detail, explain linear and nonlinear scattering losses.	2	2	16
2.	Discuss material and wave guide dispersion mechanism with necessary mathematical expression.	2	2	16
3.	What is waveguide dispersion? Derive an expression for time delay produced due to waveguide dispersion.	2	1	16
4.	What are the causes of signal attenuation in optical fiber? Explain about it in detail.	2	1	16

UNIT III

OPTICAL SOURCES AND OPTICAL DETECTORS

The laser : Introduction - Basic concepts: Absorption and emission of radiation, Population inversion , Optical feedback and laser oscillation, Threshold condition for laser oscillation- Optical emission from semiconductors: The PN junction, Spontaneous emission, Carrier recombination, Stimulated emission and lasing, Hetero junctions- LED: Introduction- Power and Efficiency - LED structures: Planar LED, Dome LED, Surface emitter LED, Edge emitter LED- LED Characteristics. Optical Detectors:Introduction ,Optical Detection Principles, Quantum Efficiency, Resposivity, P-N Photodiode ,P-I-N Photo Diode and Avalanche Photodiode.

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Why silicon is not used to fabricate LED or Laser diode?	3	2	2
2.	Define internal quantum efficiency and external quantum efficiency of LED and Laser.	3	1	2
3.	Compare the characteristics of LED and ILD.	3	2	2
4.	What are the mechanisms behind lasing action?	3	1	2
5.	Illustrate the factors that determine the response time of thephotodiode.	3	2	2
6.	What are the drawbacks of avalanche photodiode?	3	1	2
7.	Write the laser diode rate equations	3	1	2
8.	What is the significance of intrinsic layer in PIN diodes?	3	1	2
	PART B			
1.	(i)Draw and explain the structure of Fabry-Perot resonator cavity for a laser diode. Derive laser diode rate equations.	3	2	8
	(ii) With the help of a neat diagram explain the construction and working of a surface emitting LED.	3	2	8
2.	(i)What are the characteristics required for an optical source? With help of neat diagram describe the operation of surface emitting LED.	3	2	8
	(ii) Draw the structure of Edge emitting LED and Surface emitting LED & explain operation.	3	2	8
3.	(i)Draw the structure and electric fields in the APD and explain its working.	3	2	8
	(ii) Discuss various noise sources available in APD and also derive the expression for the optimum gain at maximum signal to noise ratio.	3	2	8

4.	(i) Draw and compare the construction and operation characteristics of PIN and Avalanche photo diode.	3	2	16
	(ii) What are the advantages and disadvantages over PIN Photodiode	3	2	16

UNIT IV

OPTICAL FIBER MEASUREMENTS

Introduction- Total Fiber Attenuation Measurement, Fiber Dispersion Measurements In Time Domain and Frequency Domain, Fiber Cut off Wavelength Measurements, Numerical Aperture Measurements. Fiber Diameter Measurements. Reflectance And Optical Return Loss, Field Measurements

Q.No	Question	CO	BTL	Marks
	PART A			
1.	Define the term Quantum limit.	4	1	2
2.	State the significance of maintaining the fiber output diameter constant.	4	2	2
3.	Mention few fiber diameter measurement techniques.	4	1	2
4.	What are the methods employed for measuring attenuation in optical fiber?	4	1	2
5.	What are the methods used to measure fiber refractive index profile?	4	1	2
6.	State detector response time.	4	2	2
7.	Define effective cut-off wavelength	4	1	2
8.	Compare cutback technique and insertion loss method.	4	2	2
	PART B			
1.	Explain the measurement technique used in the case of (i) Numerical aperture (ii) Refractive index profile (iii) Fiber cut-off wave length (iv) Fiber diameter	4	1	16
2.	Explain the different methods employed in measuring the attenuation in optical fiber with neat block diagram	4	1	16
3.	Discuss in detail about the methods used for measuring intermodal dispersion and chromatic dispersion.	4	2	8

4.	What are the performance measures of a digital receiver? Derive an expression for bit error rate of a digital receiver.	4	1	16

UNIT V
OPTICAL NETWORKS

Introduction- Optical Network Concepts: Optical Networking Terminology, Optical Network Node And Switching Elements, Wavelength Division Multiplexed Networks, Public Telecommunications Network Overview- Optical Network Transmission Modes, Layers And Protocols: Synchronous Networks, Asynchronous Transfer Mode, Open System Interconnection Reference Model, Optical Transport Network, Internet Protocol- Wavelength Routing Networks: Routing And Wavelength Assignment- Optical Switching Networks: Optical Circuit Switched Networks, Optical Packet Switched Networks, Multiprotocol Label Switching, Optical Burst Switching Networks- Optical Network Deployment : Long Haul Networks, Metropolitan area networks, Access networks, Local Area

Q.No	Question	CO	BTL	Marks
	PART A			
1.	State the concept of WDM. What are the advantages of WDM?	5	1	2
2.	What is SONET? Enumerate the various SONET/SDH layers.	5	1	2
3.	Write a short note on soliton.	5	6	2
4.	What is optical CDMA?	5	2	2
5.	What are the drawbacks of broadcast and select networks for wide area network applications?	5	1	2
6.	Draw the basic structure of STS – 1 SONET frame.	5	4	2
7.	What is EDFA?	5	1	2
8.	List the system requirements need in analyzing a point -to-point link.	5	1	2
	PART B			
1.	(i)Explain the architecture of SONET and discuss nonlinear effects on Network performance.	5	2	8
	(ii) Explain in detail Rise time budget and link power budget used to evaluate the link performance.	5	2	8
2.	Discuss the performance improvement of WDM and EDFA systems.	5	2	16
3.	With suitable example, explain the conditions and	5	2	16

	constraints in the formulation and solution of routing and wavelength assignment problem in an optimal way.			
4.	Write short notes on (i) Wavelength route networks (ii) Optical CDMA	5	2	16

*****END*****