ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)

Semester V/ ECE/ B.TECH

Sl.No.	Sub Code	Subject	Hrs/week			Credits
			L	T	P	C
Theory						
1	EE131501	Control System-I	3	2	0	4
2	EC131502	Analog Communication	3	2	0	4
3	EE131503	Power Electronics	3	2	0	4
4	EC131504	Microprocessor and Applications	3	2	0	4
5	EC131505	Digital Signal Processing	3	0	0	3
6	HS131506	Principles of Management	2	0	0	2
Practical						
7	EE131511	Control System-I Lab	0	0	2	1
8	EC131512	Analog Communication Lab	0	0	2	1
9	EC131514	Microprocessor and Applications Lab	0	0	2	1
10	EC131515	Digital Signal Processing Lab	0	0	2	1
Total			17	8	8	**25**
Total Contact Hours : 33						
Total Credit : 25						

Course Title : CONTROL SYSTEM-I
Course Code: EE131501
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**FUNDAMENTALS OF CONTROL SYSTEM**	Concepts of Open loop and closed loop systems. Examples of modern control systems, Definition of linear, non-linear, time-invariant and time variant, continuous and discrete control system.	6
2	**PHYSICAL SYSTEM MODELLING**	Formulation of differential equations for dynamic systems. Mechanical and Electrical systems. Transfer functions of a linear system. Block diagrams and reduction techniques, Signal flow graphs. Mason's formula. Standard test signals - step, ramp, parabolic and impulse. Impulse response.	9
3	**INTRODUCTION TO CONTROL SYSTEM COMPONENTS**	Error detectors, servo motors, techno-generators and servo amplifiers. Determination of transfer functions.	5
4	**TIME DOMAIN ANALYSIS**	Poles, Zeros and characteristic equations, Relation between S-plane root locations and transient response. Performance specifications in time domain such as overshot, rise time, settling time and steady state error. Transient response of second order systems. Derivative and Integral Control and their effect on the performance of the 2^{nd} order system. System types and error constants. Generalized error co-efficient. Transient response of higher order systems (out line only). Roth's stability criterion, scopes and limitations of Routh's criterion.	10
5	**THE ROOT LOCUS TECHNIQUE**	Introduction, Rule for construction. System analysis and design (outline only) using root locus.	8
6	**FREQUENCY DOMAIN ANALYSIS**	Logarithmic plots, polar plots, log-magnitude Vs phase plots. Nyquist stability criterion, Stability analysis. Relative stability. Close loop frequency response. Experimental determination of transfer functions. M and N circle.	10
		TOTAL	**48**

Text Books/References:

1. I.J. Nagrath & M. Gopal, "Control System Engineering", New Age International (P) Ltd.
2. Hasan-Saeed, "Automatic Control Systems", Katsons
3. Ramesh Babu and Anandanatarajan: "Control System Engineering" (Scitech)
4. Modern Control System – Hassan Sayed
5. Modern Control Engineering – Ogata
6. Control System Engineering - Nagrath and Gopal
7. Control System Components – Gibson and Teylor

Course Title : ANALOG COMMUNICATION
Course Code: EC131502
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**INTRODUCTION TO ANALOG COMMUNICATION**	Elements of Communication System-transmitter, transmission channel and receiver, concept of modulation and its need, primary communication resources and limitations. **Continuous wave linear modulation** **a) Amplitude Modulation (AM):** Time domain representation of AM signal (expression derived in single tone message), modulation index, frequency domain (spectral) representation, illustration of sideband and carrier components, transmission bandwidth for AM, phasor diagram for an AM signal, Calculation of transmitted power, sideband power and efficiency, concept of under, over and critical modulation of AM-DSB-SC **b) Other Amplitude Modulation** Double sideband and single sideband modulation (DSBSC and SSBSC): time and frequency domain expressions, bandwidth and transmission power, Hilbert transform, Basic concept of VSB: spectra and bandwidth	6
2	**GENERATION AND DETECTION OF AMPLITUDE MODULATION**	**a) Generation of AM signals:** Square law modulation, switching modulation, transistor modulation, balanced modulation **b) Generation of SSB:** Filet method, Phase Shift method, Third method **c) Detection of Linearly modulated signal:** Demodulation of AM by Envelope detector, synchronous detection of AM-SC, Effects of frequency and phase mismatch corrections	8
3	**CONTINUOUS WAVE NON-LINEAR MODULATION: ANGLE MODULATION**	a) **Frequency Modulation (FM) and Phase Modulation (PM)**: Relation between FM and PM. Single tone frequency modulation: Mathematical expression for single tone FM, Phasor representation of angle modulation (FM and PM waves). b) **Generation of FM and PM:** Narrow and wideband angle modulation, basic block diagram representation of generation of FM and PM.	8

		Concept of VCO and reactance modulator. **Demodulation of FM and PM:** Slope detector, balanced slope detector, Foster-Seeley discriminator, FM detection using PLL	
4	**FREQUENCY DIVISION MULTIPLEXING**	Frequency Division Multiplexing	8
5	**PRINCIPLES OF SUPERHETERODYNE RECEIVERS**	Intermediate frequency, local oscillator frequency, image frequency, stereo broadcasting: basic concepts with block diagram.	10
6	**ANALOG PULSE MODULATION**	Basic concepts of Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM) and Pulse Position Modulation (PPM), Illustration with the help of waveforms.	4
7	**NOISE**	Sources and characteristics of different noise. Concept of White Gaussian Noise. Noise Calculation: Noise Temperature, Noise Bandwidth and Noise Figure Performance of Analog Communication systems in the presence of noise; calculation of SNR for i) DSB-FC ii) DSB-SC iii) SSB-SC and iv) FM. Threshold effect in FM, Pre-emphasis/DE-emphasis filtering	4
		TOTAL	**48**

Textbooks:

1. B.P. Lathi & Zhi Ding, "Modern Digital and Analog Communication Systems", 2e, (Oxford University Press)
2. V. Chandra Sekar, "Analog Communication", Oxford University Press
3. H.Taub, D.L. Schilling & Gautam Saha, "Principles of Communication Systems", TMH, 4/e

Reference Books:

1. A.B.Carlson, P.B. Crilly & J.C. Rutledge, Communication Systems", McGraw Hill Co. 4/e
2. Proakis and Salehi, "Fundamentals of Communication Systems", Pearson
3. Singh and Sapre, "Communication Systems", TMH, 2/e
4. L.W. Couch, "Digital and Analog Communication Systems", McMillan Pub, 2/e
5. Sanjay Sharma, "Analog Communication Systems", KatSons.

Course Title : POWER ELECTRONICS
Course Code: EE131503
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**SEMICONDUCTOR POWER DEVICES**	(i) Power diodes, Power transistors, MOSFET, IGBT, UJT - their operating principles, structure and characteristics. (ii) Thyristors – Classification, Construction, Working principle, V-I characteristics, gate characteristics, turn-on and turn-off methods, Switching characteristics, Ratings, Protections, Mounting and Cooling. (iii) Series and parallel operation of SCRs. TRIAC -characteristics, modes of operation. GTO - operation. Triggering and control circuits.	10
2	**CONVERTER OPERATION WITH SCRS**	(i) **Single phase controlled rectifiers** - half-wave, full-wave and bridge fully controlled, half controlled circuits with R, RL, RL with freewheeling diode, RL with voltage source loads. (ii) **Three - phase controlled rectifiers** – half-wave and bridge circuits, six-pulse converter, fully controlled and half-controlled circuits with R and RL loads. Effects of load and source inductance. (iii) Dual converter and Cycloconverter operating modes. Line commuted inverters, firing and control circuits for different operations. AC voltage controller.	10
3	**SCR COMMUTATION CIRCUITS AND INVERTERS**	(i) Commutation schemes (different classes), Forced commutation circuits. (ii) **Single-phase and Three-phase Inverters** – series, parallel and bridge inverters, PWM inverter with square and sin wave output. McMurray and McMurray-Bedford inverter circuits. (iii) Voltage and current source inverters. Output voltage control, harmonics eliminations. Firing circuits for inverters.	10

4	**CHOPPERS**	(i) Principles of operation, classification, DC, AC, and multi- quadrant choppers. (ii) Buck, Boost, Buck-Boost converters. Jones and Morgan's choppers. Application.	10
5	**APPLICATIONS**	(i) Switched mode power supply (SMPS), Uninterruptible power supply (UPS), SCR battery chargers (ii) Induction heating, Dielectric heating.	8
		TOTAL	**48**

Text/Reference Books:

1. Power Electronics - Sen, P.C. - Tata Mc Graw Hill.
2. Power Electronics - P S Bimbhra -Khanna Publishers.
3. Power Electronics - M D Singh and K B Khanchandani -Mc Graw Hill.
4. Power Electronics, Circuits, Devices and Applications - Rashid M.H. - Prentice Hall of India.
5. Modern Power Electronics and AC Drives - B. K. Bose - Pearson Education.
6. Power Electronics - K. Hari Babu – SCITECH.

Course Title : MICROPROCESSOR AND APPLICATIONS
Course Code: EC131504
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**INTRODUCTION**	Evolution of microprocessors, technological trends in microprocessor development. The Intel family tree. CISC Versus RISC. Applications of microprocessors. 8086 CPU ARCHITECTURE: 8086 Block diagram, description of data registers, address registers, pointer and index registers, PSW, Queue, BIU and EU. 8086 Pin diagram descriptions, generating 8086 CLK and reset signals using 8284, WAIT state generation. Microprocessor BUS types and buffering techniques, 8086 minimum mode and maximum mode of operation.	10
2	**8086 INSTRUCTION SET**	Instruction formats, addressing modes, data transfer instructions, string instructions, logical instructions, arithmetic instructions, transfer of control instructions. Stack Manipulation, Call and return instructions, REP Prefix, Segment override prefix, and simple assembler directives such as label, Variable, DB,DW, DD, EQU, END, Assume, Pointer (byte, Word, Double Word, Near, Short, and Far) 8086 PROGRAMMING TECHNIQUES: Assembly Language programs for logical processing, arithmetic processing, timing delays, loops, data conversions. Procedures, data tables, modular programming. Macros, byte and string manipulation, I/O programming.	15
3	**MAIN MEMORY SYSTEM DESIGN**	Memory devices, 8086 CPU Read/Write timing diagrams in minimum mode and maximum mode. Address decoding techniques. Interfacing SRAMS, ROMS/PROMS. Interfacing and refreshing DRAMS. DRAM Controller –TMS4500.	9
4	**BASIC I/O INTERFACE**	Parallel and Serial I/O Port design and address decoding. Memory mapped I/O Vs Isolated I/O, Intel's 8255 and 8251- description and interfacing with 8086. Interfacing ADCs, DACs, Keyboards, alphanumeric displays, multiplexed displays, and high power devices with 8086. INTERRRUPTS AND DMA: Interrupt driven I/O. 8086 Interrupt mechanism: interrupt types and interrupt vector table. Intel's 8259. DMA operation. Intel's 8237.	14
		TOTAL	**48**

TEXT/REFERENCE BOOKS:

1. D.V.Hall , Microprocessors and Interfacing , McGraw Hill 2nd ed.
2. J Uffenbeck , The 8086/8088 family , (PHI).
3. Liu,Gibson , Microcomputer Systems – The 8086/8088 family, (2nd Ed-PHI).
4. Douglas V.Hall, Microprocessor and Interfacing, 2nd Edition, TMH, 2006
5. W. A. Triebel and A. Singh, The 8088 and 8086 Microprocessor Programming: interfacing Software and hardware applications, 2002, PHI.
6. B. B. Brey, The Intel microprocessor: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium processor, 2002, Pearson Education India

Course Title : DIGITAL SIGNAL PROCESSING
Course Code: EC131505
L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**INTRODUCTION**	What is DSP, block diagram of DSP System, its application and advantages **Discrete time signals (an overview):** Concept of discrete time signals, basic idea of sampling and reconstruction of signals, sequences-periodic, energy, power, unit sample, unit step, unit ramp, real and complex exponentials, arithmetic operation and sequences.	4
2	**LTI SYSTEMS (AN OVERVIEW)**	Definition, representation, impulse response, derivation of the output sequence, linear convolution, graphical and analytical method, stability and causality condition, recursive and non-recursive systems, FIR and IIR systems Linear Time Invariant (LTI) systems characterized by constant coefficient difference equations.	4
3	**Z TRANSFORM**	Definition of z transforms and Region of Convergence (ROC), Properties of ROC and Z transform. Inverse Z transform by power series expansion method, partial fraction method, contour integration or residue method. **Analysis of LTI Discrete Time Sequence using z transform:** Transfer function of LTI discrete time system, Impulse response and transfer function, response of LTI discrete time system using z transform, convolution and deconvolution using z transform, causality and stability of LTI discrete time system, characterization of LTI discrete time system by linear constant coefficient difference equation, determination of poles and zeros of rational Z transform.	6

4	**REALIZATION OF DIGITAL FILTERS IN BLOCK DIAGRAM AND SIGNAL FLOW GRAPH REPRESENTATION**	**IIR filters:** Direct form I, Direct Form II, cascade, parallel and ladder form structure **FIR Filters:** Direct Form structure, Cascade form structure, Linear phase FIR structure	3
5	**a) DISCRETE TIME FOURIER TRANSFORM (DTFT) OR SIMPLY FOURIER TRANSFORM OF A DISCRETE TIME SIGNAL** **b) TRANSFER FUNCTION OF LTI DISCRETE TIME SYSTEM IN FREQUENCY DOMAIN**	Definition: Frequency Spectrum of discrete time signals, Magnitude and phase spectrum, Inverse Discrete time Fourier Transform, Comparison of Fourier Transform of discrete and continuous time signal, properties of Discrete Time Fourier transform Frequency response of LTI discrete time system, properties of Frequency response	4
6	**a) REPRESENTATION OF PERIODIC SEQUENCES** **b) FOURIER REPRESENTATION OF FINITE DURATION SEQUENCES**	Discrete Fourier series, Properties of Discrete Fourier Series, Periodic convolution Discrete Fourier Transform (DFT), Properties of DFT, Circular Convolution, Linear Convolution using DFT, relation between DFT and z transform	4
7	**EFFICIENT COMPUTATION OF DFT**	Fast Fourier Transform (FFT), Decimation in time FFT algorithm: In place Computation, Decimation in Frequency FFT algorithm: in place computation	3
8	**a) DESIGN OF DISCRETE TIME IIR FILTERS FROM CONTINUOUS TIME FILTERS** **b) BASIC LOWPASS ANALOG FILTER APPROXIMATION**	i) Impulse Invariance Method: transformation of analog system function H_a (s) to digital system function H(Z). Relation of s-plane to z plane. Design steps for Impulse Invariance method. Drawback of Impulse Invariance Method ii) Bilinear transformation method: Comparison of Impulse Invariance Method and Bilinear transformation method i) Butterworth filter approximation ii) Chebyshev filter approximation iii)Elliptic filter approximation	5

9	**FIR FILTER DESIGN**	i) Ideal Frequency Response of Linear Phase FIR filters: Characteristics of FIR Filters with linear phase ii) Design of Linear Phase FIR filter using windows iii) Commonly used windows: Rectangular window, Hamming window, Hanning window, Blackman window	3
		TOTAL	**36**

TEXT BOOKS:

1. A Nagoorkani, "Digital Signal Processing", McGraw Hill Education (India) Pvt. Ltd (2e)
2. J.G.Proakis, D.G. Manolakis and D. Sharma, "Digital Signal Processing: Principles, Algorithm and Application", Pearson
3. P.Ramesh Babu, "Digital Signal Processing", Scitech

REFERENCES:

1. A. V. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Pearson
2. S.K.Mitra," Digital Signal Processing: A Computer based Approach", TMH (4e)
3. S. Salivahannan, A. Vallabraj and C. Gnanapriya, "Digital Signal Processing", TMH, 2e
4. M.H. Hayes, "Digital Signal Processing", Schaum's Outline, TMH, 2e

Course Title : PRINCIPLES OF MANAGEMENT
Course Code: HS131506
L-T-P-C: 2-0-0-2

Class Hours/week	2
Expected weeks	12
Total hrs. of classes	24

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**MANAGEMENT**	Definition, nature, importance, evolution of management thoughts – pre & post scientific era, contributions made by Taylor, Fayol, Gilbreth,Elton Mayo, McGregor, Maslow – covering Time & Motion Study, Hawthrone Experiments; Is management a science or art? Functions of manager, ethics in managing and social responsibility of managers.	4
2	**PLANNING & CONTROL**	Why Management process starts with planning, steps in planning, planning premises, types of planning, barriers to effective planning, operational plan, strategic planning, Mckinsey's 7's Approach, SWOT analysis, Controlling-concept, Planning- control relationship, process of control, human response to control, dimension of control, MBO.	4
3	**DECISION MAKING & ORGANIZING**	Nature, process of decision making, decision making under Certainty and Uncertainty, decision-tree, group-aided decision, brain-storming. Organizing – concept, nature and process of organizing, authority and responsibility, delegation and empowerment, centralization and decentralization, concept of departmentation.	4
4	**STAFFING & MOTIVATION**	Concept, Manpower planning, Job design, recruitment & selection, training and development, performance appraisal, motivation, motivators and satisfaction, motivating towards organizing objectives, morale building.	3
5	**LEADERSHIP & COMMUNICATION**	Defining leadership and its role, should managers lead, leadership style, leadership development, Leadership behaviour. Communication- Process, Bridging gap-using tools of communication, electronic media in Communication.	3
6	**FINANCIAL MANAGEMENT**	Financial functions of management, Financial Planning, Management of Working Capital, Sources of Finance.	3

7	**MARKETING MANAGEMENT**	Functions of Marketing, Product Planning & Development, Marketing Organization, Sales Organization, Sales Promotion, Consumer Behaviour, Marketing Research and Information.	3
		TOTAL	**24**

TEXTBOOKS/REFERENCE BOOKS:

1. Robbins & Caulter, Management, Prentice Hall of India.
2. John R.Schermerhorn, Introduction to Management, Wiley-India Edition.
3. Koontz, Principles of Management, Tata-McGrew Hill.
4. Richard L. Daft, New Era of Management, Cengage Learning.
5. Stoner, Freeman and Gilbert. Jr., Management, Prentice Hall of India.
6. Koontz, Weihrich, Essentials of Management, Tata-McGrew Hill.
7. D.C. Bose, Principles of Management and Administration, Prentice Hall of India.

PRACTICALS

Course Title : CONTROL SYSTEM-I LAB
Course Code: EE131511
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Study of various Matlab Syntax related to control system	3
2	Study of Matlab preliminary commands and Matlab graphics functions	3
3	Determination of Transfer Function	3
4	Determination of Poles and Zeroes of Transfer Function	3
5	Study of different time response functions related to control system	3
	TOTAL	**15**

Course Title : ANALOG COMMUNICATION LAB
Course Code: EC131512
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1.	Study of Amplitude Modulation (DSB-SC) and Demodulation.	3
2.	Study of Amplitude Modulation (DSB-FC) and to find out the modulation index.	3
3.	Study of Demodulation of AM Signal (DSB– FC).	3
4.	Study of PLL (Phase Locked Loop).	3
5.	Study of Pulse Amplitude Modulation (PAM).	3
6.	Study of Selectivity of a Radio Receiver via cable.	3
7.	Study of Image frequency.	3
8.	Study of Frequency Modulation.	3
9.	Study of demodulation of FM signal.	3
	TOTAL	**27**

Course Title : MICROPROCESSOR AND APPLICATIONS LAB
Course Code: EC131514
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Introduction to MASM and TASM. Assembling and executing the programs.	3
2	Programs involving data transfer instructions a) Byte and word data transfer in different addressing mode b) Block move with overlap and without overlap c) Block exchange	3
3	Programs involving arithmetic and logic operation on signed and unsigned multi byte numbers a) 16-bit addition and subtraction b) 32 addition and subtraction c) 16-bit multiplication of signed and unsigned numbers d) 8-bit division of signed and unsigned numbers e) 16-bit division of signed and unsigned numbers	3
4	Code conversions a) Converting BCD into ASCII b) Binary to BCD c) BCD to binary	3
5	Program involving string manipulation a) String reversal b) Comparison of two strings c) Program to search for a character in a string d) Program to check for a palindrome	3
6	Programs involving branch / loop instructions a) Program to find largest and smallest in a series. b) Program to sort the numbers in ascending/ descending order. c) Addition of n numbers	3
7	Program to use DOS interrupt 21H function a) Program to read a character from keyboard b) Reading a key without ECHO c) Read a string of 10 characters from keyboard into a buffer d) Display a character and string on console e) Create a file, write a file f) Read system date, set system date, read system time, set system time	3

8	Interfacing experiments a) Matrix keyboard interfacing b) Seven segment display interface c) Stepper motor interface d) Logical controller interface	3
	TOTAL	**24**

Course Title : DIGITAL SIGNAL PROCESSING LAB
Course Code: EC131515
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

Programs Executed by the Digital Signal Processor TMS320C6713 on the C6713 DSK board

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1.	Signal Generation : Generation of monotone (Sinusoidal / Square/ Triangular) and multi-tone (sinusoidal) signal (with varying frequency, sampling rate and amplitude)	2
2.	Linear Convolution: Implementation of linear convolution of two data stream.	2
3.	FIR Filtering: Designing of a (i) Low Pass (ii) Band Pass (iii) High Pass FIR filter. Application on real audio signals.	2
4.	IIR Filtering: Designing of a (i) Low Pass (ii) Band Pass (iii) High Pass FIR filter (Butterworth with different order). Application on real audio signals.	2
5.	Fourier transform / Fourier Series: Implementation of Fourier transform and Fourier series for a data stream (N Samples).	2
	TOTAL	**10**

Programs written and simulated using MATLAB

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1.	Given a causal system y(n)=0.9y(n-1)+x(n) (a)Find H(z) and sketch its pole-zero plot. (b)Plot the magnitude response and phase response.	3
2.	A third–order low pass filter is described by the difference equation y(n) = 0.0181x(n) + 0.0543 x(n-1) + 0.543 x(n-2) +0.0181 x(n-3)+1.76y(n-1) - 1.1829y(n-2)+0.2781y(n-3).Plot the magnitude and phase response of the filter and verify that it is a low pass filter.	3
3.	Compute DFT of a sequence and plot magnitude and phase response (a) without function and (b) using function.	3
4.	For two given sequences, find linear convolution.	3

5.	For two given sequences, find circular convolution using DFT method.	3
6.	Convert analog filter into digital filter using (a) Impulse invariance transformation and (b) Bilinear transformation.	3
7.	Design a 25-tap (N=25) LPF with cut off frequency0.5pi radian using (a) Rectangular window and (b) Hamming window. Plot their frequency response.	2
8.	Design a 25-tap (N=25) HPF with cut off frequency 0.6pi radian using (a) Hamming window and (b) Blackman window. Plot their frequency response.	2
9.	Design a Butterworth LPF satisfying the following specifications Passband attenuation=0.4dB Stopband attenuation=20dB Stopband frequency=400Hz Passband frequency=800Hz	2
10.	Write a Matlab program to plot magnitude response and phase response of digital Chebyshev type-I low pass filter.	2
	TOTAL	**26**

****