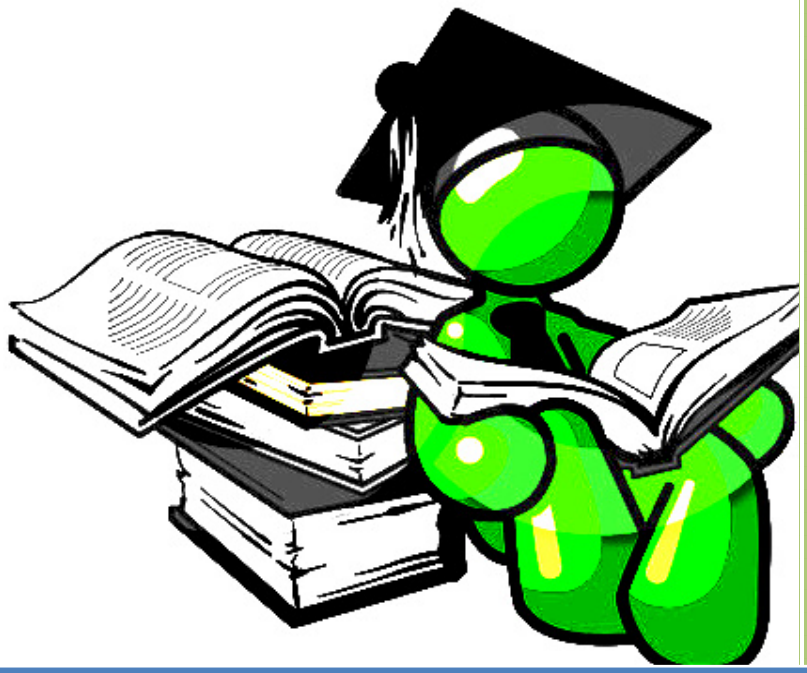
FH-2015



ACADEMIC BOOK

PADMABHUSHAN VASANTDADA PATIL PRATISHTHAN'S
COLLEGE OF ENGINEERING
SINCERITY SACRIFICE
SYSTEM
1990
Empower The Knowledge

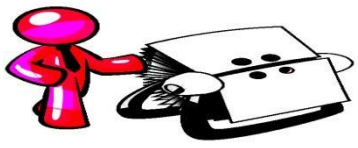
SEMESRTER VI

TE-ELECTRONICS

FH-2015

ACADEMIC BOOK

INDEX



Department of Electronics Engineering
FH OF 2014 -SEM – IV /VI / VIII

Rules and Regulations

College Timings:

The college timing is from 8:45 AM to 4:45 PM .The students must follow the college timing.

Academic calendar and Time table:

The details of academic curriculum and activities are mentioned in the academic book. The students are required to strictly follow the class Time table and academic calendar.

Attendance:

All students are hereby informed that attendance for lectures/practical/tutorials is compulsory. Mumbai University does not allow students to appear for examination if their attendance is less than 75%.But for the good academic performance of the students, the department expects 100 % attendance in theory and practical separately.

Defaulters:

Defaulters list will be displayed monthly. The defaulter students are required to bring their parents/guardians within four days after the display of defaulters list. If students remain defaulter consistently he/she has to face the consequences as laid by the Mumbai University.

Assembly/prayer:

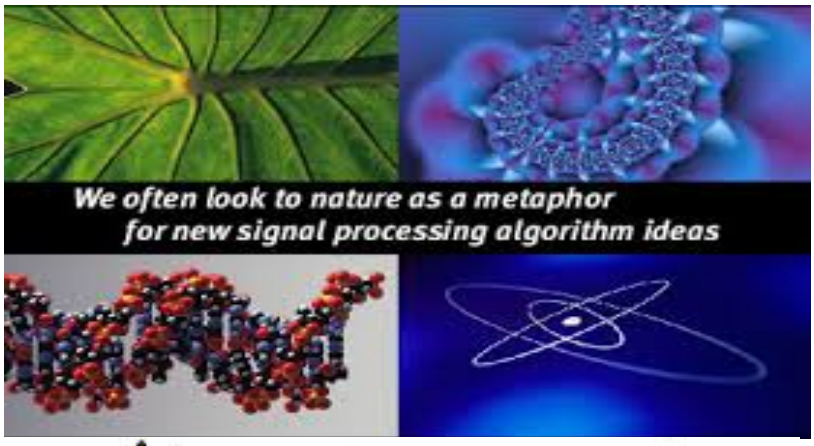
The Assembly /Prayer starts at 8:50 AM. The student must remain present in their respective classes for the prayer. The students reporting the college late will be treated as late comers and their attendance will be noted in the separate register. After three late marks the students are expected to bring their parents /guardians to the college.

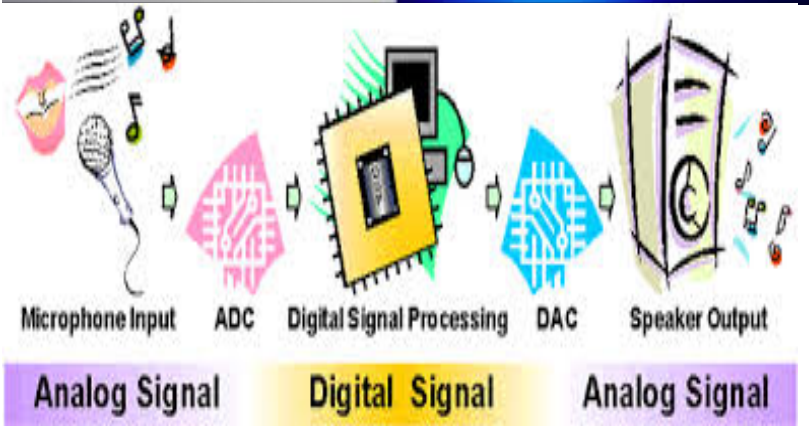
Identity card:
Student must wear ID during college hours in the campus.

Mobile Phone:
Use of cell phone is strictly prohibited in the college premises.

Examination:
As per the university norms, there will be two term test i.e Mid Term test and End Term test in the semester which is an integral part of Internal Assessment for every subject. Both the examination will be based on 40 % and 70 % of theory syllabus respectively for each subject and will be conducted as per the dates mentioned in the academic calendar. Attendance for both internal examination IS COMPULSORY .As per the university norms, no retest will be conducted under any circumstances. Separate passing heads is compulsory for internal and external examination for individual subjects. If the student fails in any of the exam he/she has to reappear in the concerned subject after the declaration of the result.

Practicals/tutorials/Assignments:
The Student should compulsory bring their rough and fair journal for the concerned subject for every practical and tutorials and get it checked regularly. Failing to do so, they will not be allowed for the practical. The Assignments for every subject should be submitted on regular basis.
The student must abide by the above mentioned rules and regulations laid down by the department for their better and brighter future.





FH-2015

POWER ELECTRONICS & DRIVES

PRITI TYAGI

PVPP COLLEGE OF ENGINEERING

(ELECTRONICS ENGINEERING)

Subject Plan

GROUP NAME : SIGNALS AND SYSTEM
COURSE TITLE : Digital Signal Processing and Processors **COURSE CODE : EXC 605** **SEM : VI (FH 2015)**
PRE-REQUISITE : Signals and Systems

RATIONALE

This second course in signals and systems group aims to introduce the student to the idea of discrete time signal processing as a foundation course for subjects like image processing, speech processing, adaptive signal processing, Advance Digital Signal Processing. It also covers introduction to DSP processors.

Digital Signal Processing is concerned with Mathematical and algorithmic manipulation of discrete and quantized or naturally digital signals in order to extract the most relevant and pertinent information that is carried by the signal.

OBJECTIVES :

1. To equip the students with a broad foundation of Discrete time signals and Systems.
2. To introduce the basic concepts and techniques for processing signals on a computer.
3. To learn efficient computation of the DFT, FFT algorithms and applications of the FFT algorithms.
4. To provide a thorough understanding and working knowledge of design, implementation, analysis and comparison of digital filters for processing of discrete time signals.
5. To study the effect of finite word length in signal processing.
6. To study basic concepts and architectures of DSP Processors.
7. To emphasize intuitive understanding and practical implementations of the theoretical concepts.
8. To develop an appreciation of the application of his/her knowledge in actual industry and project work.
9. To prepare the students to excel in post graduate studies.

OUTCOME :

1. To gain Knowledge of Fundamental and widely applied digital signal processing methods.
2. Student will be able to propose, design, implement and validate appropriate DSP techniques for a broad spectrum of real-world applications.
3. To understand the Transform domain and its significance and problems related to computational complexity.
4. Appreciate efficient computation of DFT using FFT.
5. Be able to specify and design any digital filters using MATLAB / SCILAB
6. Familiarize himself/herself with DSP Processors.
7. Understand the use and application of DSP Processor.
8. Understand the effects of Hardware Limitations.
9. To prepare the students to excel in post graduate exams.
10. Familiarize himself / herself with MATLAB/SCILAB Software.
11. Apply the principles in designing digital filters and other real time applications.

LEARNING RESOURCES: -

RECOMMENDED BOOKS: -

1. Proakis J., Manolakis D., "Digital Signal Processing", 4th Edition, Pearson Education
2. Oppenheim A., Schafer R., Buck J., "Discrete Time Signal Processing", 2nd Edition, Pearson Education.
3. Babu R., "Digital Signal Processing", 4th Edition, Scitech Publications.
4. B.Venkata Ramani and M.Bhaskar, Digital Signal Processors, Architecture, Programming and TMH, 2004Ashok Ambardar, Digital Signal Processing, Cengage Learning Publication.
5. L. R. Rabiner and B. Gold, “Theory and Applications of Digital Signal Processing”, Prentice-Hall of India, 2006.
6. B. Kumar, “Digital Signal Processing”, New Age International Publishers, 2014.
7. J.G. Proakis, D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and applications, Prentice Hall of India, 1995
8. E.C. Ifeachor and B.W. Jervis, Digital Signal Processing A Practical approach, Pearson Publication

COURSE MATERIALS MADE AVAILABLE

1. Course instructional objectives & outcomes
2. Syllabus
3. Chapterwise Question Bank

Evaluation :

Theory Exam	80 M
Internal assessment:-. The average marks of Mid-term test (20 M) & End-term test (20 M) will be considered as final IA marks	20 M
Oral	25 M
Term Work	25 M
Total	150 M

List of Experiments

Atleast 10 experiments based on the entire syllabus

Expt. No.	Name of the Experiments
1	To Compute the DFT of the given sequence & plot magnitude & phase response by using MATLAB/SCILAB
2	To find cross-correlation using FFT by using MATLAB/SCILAB
3	To design Butterworth filter for the given specification using MATLAB/scilab
4	To design Chebyshev filter for the given specification using MATLAB/SCILAB
5	IIR filter design using impulse invariance method using MATLAB/SCILAB
6	IIR filter design using BLT method using MATLAB/SCILAB
7	FIR filter design using different windows using MATLAB/SCILAB
8	FIR filter design using frequency sampling method using MATLAB/SCILAB
9	Introduction to FDA tool for filter design
10	Study of Effect of quantization on filter design
11	Study of different instruction sets of TMS 320c67xx DSP processor
12	Applications of DSP (Speech Processing)
13	Applications of DSP (Image Processing)
14	Applications of DSP(Multirate Signal Processing)

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors

Chapter No. : 1

Chapter Name : Discrete Fourier Transform and Fast Fourier Transform

Approximate Time Needed : 15 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Introduction
2	Discrete Fourier Series
3	Properties of Discrete Fourier Series
4	Discrete Fourier Transform
5	Properties of Discrete Fourier Transform
6	Properties of Discrete Fourier Transform
7	Circular Convolution
8	Linear Filtering Using DFT
9	FFT
10	Decimation in Time Algorithm
11	Decimation in Time Algorithm
12	Decimation in Frequency Algorithm
13	Decimation in Frequency Algorithm
14	Inverse FFT
15	Composite FFT

Objectives:

1. Become familiar with the computation of DFS coefficient of the periodic sequence.
2. Understand the relationship between DFS coefficients and DFT of a periodic sequence that equals single period of periodic sequence.
3. Learn Properties of Discrete Fourier Transform and use them to simplify computation.
4. Explore DFT as a computational tool for linear system analysis.
5. Study computationally efficient algorithms for evaluating the DFT

6. Analyze different approaches for efficient computation of DFT
7. Understand basic principles underlying fast computation of DFT.
8. Learn the basic decimation operation involved in decimation in time and decimation in frequency FFT algorithms

Lesson Outcome:

Students will able to

1. Develop DFT by sampling the spectrum
2. Gain knowledge of DFT, its properties and its applications.
3. Learn processing methods where DFT is especially useful for Linear filtering
4. To understand the Transform domain and its significance and problems related to computational complexity.
5. Appreciate efficient computation of DFT using FFT.

Model Questions:

JUNE 2014

1. What are the advantages of FFT over DFT with some suitable example. **5**

2. By means of DFT/IDFT. Determine the sequence $x_3[n]$ corresponding to the circular convolution of the sequence $x_1[n] = \{2, 1, 2, 1\}$ and $x_2[n] = \{\underset{\uparrow}{1}, 2, 3, 4\}$. **10**

3. Consider a sequence $x[n] = \{1, 2, 1, 2, 0, 2, 1, 2\}$. Compute DFT using DIT, FFT Algorithm. **10**

4. Two sequences are given as $x_1[n] = \{1, 2, 3, 4\}$ and $x_2[n] = \{5, 6, 7, 8\}$. Also $x[n] = \{1 + 5j, 2 + 6j, 3 + 7j, 4 + 8j\}$. Compute $X[k]$ and find DFT of $x_1[n]$ and $x_2[n]$ using result only. **10**

DEC 2013

1. State and explain Parseval's Theorem in DFT.

(a) Find the DFT of the following sequence using FFT :– **10**

$$x[n]=\{1,1,1,0,0,0,1,1\}$$

(b) Using the result derived in Q.5 (a) Find the DFT of the signal and not otherwise :– **10**

(i) $x_1[n] = \{1,0,0,0,1,1,1,1\}$

(ii) $x_2[n] = \{1,1,1,1,1,0,0,0\}$

2. Find the 4pt. DFT of the sequence :– **10**

3.
$$x[n]=\cos\frac{n\pi}{4}$$

4. Find the number of complex addition and complex multiplication required to find DFT for 16 point signal. Compare them with number of computations required, if FFT algorithm is used. **5**

5.

(a) Consider a sequence x [n] = {1, 2, 1, 2, 0, 2, 1, 2}. Determine DFT using DITFFT. **10**

(b) Find DFT of the sequence x [n] = {1, 2, 3, 4} and using this result and not otherwise. **10**
Find DFT of –

(i) $x_1[n] = \{1, 0, 2, 0, 3, 0, 4, 0\}$

(ii) $x_2[n] = \{1, 2, 3, 4, 0, 0, 0, 0\}$

(iii) $x_3[n] = \{1, 2, 3, 4, 1, 2, 3, 4\}$

6. Derive the composite radix for $\delta = 2 \cdot 3$ algorithm. Draw the flow chart. **10**

May 2012

1. Calculate the speed improvement factor in calculating 256 point DFT of a sequence using direct computation and using FFT algorithm **5**

2. Determine the circular convolution of the two sequences $x_1(n)$ and $x_2(n)$ if- 10

$x_1(n) = \delta(n) + \delta(n-1) - \delta(n-2) - \delta(n-3)$ and

$x_2(n) = \delta(n) - \delta(n-2) + \delta(n-4)$

3.

a) Given $x(n) = 2^n$ and N=8, find X(K) using DIT-FFT algorithm. 10

b) For x(n)={ 1+5j, 2+6j, 3+7j, 4+8j }, find DFT X(K). 10

Using the result above and not otherwise, find DFT of following sequences:-

i) x1(n) = { 1 , 2, 3, 4 } and ii) x2(n) = { 5, 6, 7, 8 }.

4.

Using DFT/IDFT , find circular convolution of- x1(n) = { 1 , 1, 2, 2 } and x2(n) = { 1, 2, 3, 4 }. 10

Dec 2011

1.

Find the number of complex addition and complex multiplication required to find DFT for 16 point signal. Compare them with the no. of computation required if FFT algo is used.

2.

By giving analysis and synthesis equation for DTFT,DFT and z-transform. Describe it, with the help of physical interpretation.

4. (a) Let x(n) be a real valued sequences of length 'N' and let x(k) be its DFT with real and imaginary part x_R (k) and x_I (k) respectively. Show that if x(n) is real $x_R(k) = x_R(N-k)$ and $X_I(k) = X_I(N-k)$ for k = 1.... (N–1). **10**

(b) Consider the length 8 – sequence defined for $0 \leq n \leq 8$. **10**

x (n) = { 1, 2, –3, 0, 1, –1, 4, 2 }.

(b) Using DFT / IDFT method, find response of the system with impulse response.

h(n) = 2δ (n) + 5δ (n) if the input to the system is

x(n) = 2δ (n) + 3δ (n–1) + 5δ (n–2).

with a 8-point DFT. Evaluate the following function x(k) without computing DFT.

(i) x(0) (ii) x(4) (iii) $\sum_{k=0}^{7} x(k)$ (iv) $\sum_{k=0}^{7} |x(k)|^2$

6.

Derive the composite radin for 6 = 2·3 algorithm and draw the flow graph. **10**

June 2011

1.

Find the number of complex additions and complex multiplications required to find DFT for 16 point signal. Compare them with the number of computations required if FFT algorithm is used.

2.

Develop DIT-FFT algorithm for N = 6 and draw the flow graph.

3.

Given the 8 point DFT of the sequence :

$x(n) = 1,\ 0 \le n \le 3$

$= 0,\ 4 \le n \le 7$

(i) Find its DFT using D I F F F T algorithm using this result (X(k)) and DFT property (Not otherwise) find DFT of $x_1(n)$ and $x_2(n)$.

(ii) Where $x_1(n) = 1$, for $n = 0$

$= 0$, for $1 \le n \le 4$

$= 1$, for $5 \le n \le 7$

(iii) Where $x_2(n) = 0$ for $0 \le n \le 1$

$= 1$ for $2 \le n \le 5$

$= 0$ for $6 \le n \le 7$

4.

Using DFT/IDFT method find the response of the system with impluse response $h(n) = 5\,\delta(n) - 2\,\delta(n-1)$, if the I/P to the system is $x(n) = 3u(n) - 2u(n-2) - u(n-3)$.

5.

Explain block convolution using overlap Add OR overlap save method.

DEC 2010

1.

(a) Find the output of a system using circular convolution (in time domain) if the input and impulse responses are given by : **6**

$x(n) = (1, 2, 3, 1, 2)$ and $h(n) = (2, 1, 4)$

↑ ↑

(b) Explain the relation between Discrete Time Fourier Transform (DTFD, Z- transform and DFT, giving relevant expression. **6**

(c) Find DFT of the following sequence using DIT FFT **8**

$x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$.

↑

(a) Derive the relations to find DFT of two real N point sequences using only a single N point DFT. **8**

(b) Using the above relations, find DFTs of **8**

$x_1(n) = \{1, 1, 1, 1\}$ and $x_2(n) = \{2, 1, 2, 1\}$

(c) Find IDFT of the sequences **4**

$x(k) = \{10, -2 + j2, -2, -2 - j2\}$ using

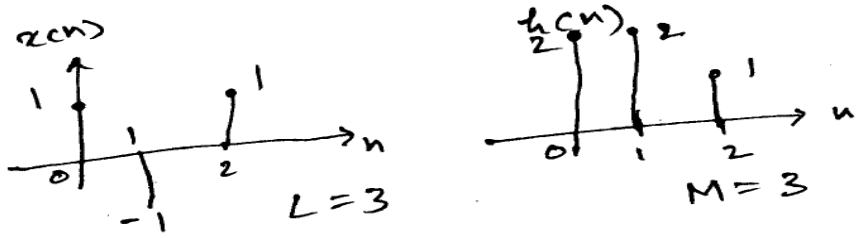
Diecimation in time algorithm.

3.

Calculate the number of multiplications needed in the calculation of DFT using FFT algorithm with 32-point sequence. **5**

4.

Use DFT to compute the linear convolution of the signals shown below. **10**



5. Derive composite radix for 6 = 2·3 algorithm and draw the flow graph.

6. (a) Derive the DFT of the sample data sequence α x (n = { 1,1,2,2,3,3 } and compute the corresponsing amplihide and phase spectrum. **10**

(b) Compute the DFT of the sequence $x(n) = \cos \frac{n\pi}{2}$ where N = 4, using DIF FFT algorithm. **10**

7. Write the properties of twiddle factor.

June 2010

1.
(b) Determine IDFT of X(K) = {3, 2 + j, 1, 2 – j } **5**
(c) What is the advantage of FFT over DFT in terms of calculations ? Justify your answer with a suitable example. **5**
(d) Derive the relationship between Z-Transform and Discrete Fourier Transform. **5**

2. Derive the composite radix for 6 = 2·3 alongorithm and draw the flow graph. **10**

3. (a) Consider a sequence x(n) = { 1, 2, –3, 4, 4, –3, 2, 1 }. Determine the DFT of sequence x(n) using decimation in frequency (DIF) FFT algorithm. **10**
(b) Find DFT of the following signal by using DFT only once : **10**
$x_1(n) = [1\ 4\ 5\ 3]$
$x_2(n) = [4\ 3\ 2\ 3]$.

4.
(a) (i) Given X(K) = { 2, –6j, 2 – 8j, 6j, 2, –6j, 2 + 8j, 6j }. Find x(n) using any IFFT algorithm. **8**
(ii) Explain where overlap add and overlap save methods are used ? **2**

5.
(d) State any 4 properties of DFT
(e) Write the properties of twiddle factor.

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors

Chapter No. : 2

Chapter Name : FIR DIGITAL FILTERS

Approximate Time Needed : 10 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
16	Digital filters Introduction
17	Characteristics of FIR digital Filters
18	Frequency Response of FIR filters
19	Linear Phase FIR Filters.
20	Location of zeros of Linear Phase FIR Filter
21	Location of zeros of Linear Phase FIR Filter
22	Gibbs Phenomenon
23	Design of FIR Filters using Window Techniques
24	Design of FIR Filters using Window Techniques
25	Frequency Sampling Technique

Objectives:

1. To Understand how digital filter design requirements are specified and what parameters are need to specify each frequency Band.
2. To introduce the concept of FIR filters, its applications and advantages and disadvantages compared to IIR filters.
3. Learn the advantages of linear phase FIR filters and study the properties of four types of linear phase filters in terms of impulse response, magnitude response and the placement of zeros.
4. Understand the restrictions placed on the kind of frequency selective filter that can be designed with each type.

5. To make the students understand the theory of designing filters using windows and discussing various windowing techniques, i.e. the roles played by ideal filter and window function in overall approximation.
6. Learn the concept behind frequency sampling technique of filter design and the role played by interpolation of the frequency response in the approximation process.
7. Design FIR filter to meet specific magnitude and phase requirements.
8. Develop skill in using MATLAB window function and ideal filter function to deign linear phase FIR filter.

Lesson Outcomes:

The student will be able to

1. Design digital FIR filter based on the parameters specified to meet specific magnitude and phase requirements.
2. Exemplify the advantages of linear phase FIR filters and the properties of four types of linear phase filters in terms of impulse response, magnitude response and the placement of zeros.
3. Design FIR filters using windowing techniques and frequency sampling technique.

Model Questions:

1. Design an FIR filter to approximate an ideal L.P.F. with pass band gain of unity, cut-off frequency of 850 Hz and working at a sampling frequency of f_s=5Khz, the length of impulse response should be 5. Use rectangular window.
2. Compare FIR vs. IIR Filter.
3. What is major problem associated with designing of FIR filter using window method & frequency sampling method. Explain how optimal linear phase FIR filter can be designed to overcome these problems.
4. A L.P. Digital FIR filter meeting following specifications is required:

   $\alpha_p \leq 1$ db , $\alpha_s \geq 44$ db, W_p=30 rad/s, W_s=50 rad/s, W_{sf}= 200 rad/s, find order of filter using Kaiser window.
5. Find impulse response of a linear phase third order FIR filter having symmetric coefficients. The filter should have only one real zero. Give reasoning for the selection of zero.
6. Design lowpass FIR linear phase filter with 11 coefficients using Hamming window for the following specifications.

   Passband frequency: 0.25 KHz

   Sampling frequency: 1 KHz

7. Explain the design steps of FIR filter using frequency sampling method. Give merits and demerits over window method.
8. What are conditions that must be imposed on impulse response of FIR filter to obtain linear phase response? Identify which of impulse of the following will give linear phase response? Why? Assume· 4thsarnple as the origin.

   h1 (n) = (1,3,4,2,4,3,1)

   h2 (n) = (1,3,4,2,1,3,4)
9. Write a short note on Kaiser Window.
10. Design an FIR Filter for δ_p=0.01, δ_s =0.1, w_p=0.2, w_s=0.6 using any suitable window
11. Design a frequency sampling filter for following specification

    $|\mathrm{H}(\mathrm{k})| = \{1, 1, 0, 0, 0, 1\}$

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors
Chapter No. : 3 Chapter Name : IIR DIGITAL FILTERS Approximate Time Needed : 10 hrs
Lesson Schedule :

Lecture No.	Portion covered per hour
26	Mapping of s-plane to z-plane. Impulse Invariance method
27	Bilinear Z – Transformation method
28	Frequency Warping, Pre-warping
29	Analog filter Approximations-Butterworth filter
30	Analog filter Approximations-Chebyshev filter
31	Design of IIR Filters
32	Design of IIR Filters
33	Design of IIR Filters
34	Analog Frequency transformation
35	Digital Frequency Transformation

Objectives:

1. Learn the characteristics and parameter structures of the basic analog butterworth and Chebyshev filter.
2. Learn the basic concepts and the limitations of Impulse Invariant transformation
3. Understand bilinear mapping and frequency pre warping concept.
4. Develop skill in designing digital Low pass filter using any analog prototype and filter transformations.

4. Know how to map cut off frequencies of digital filters (of any type) into digital lowpass prototype filter frequencies, using parameters of the frequency band transformation.

5. Study and practice arbitrary frequency selective digital filter design using MATLAB

Model Questions:

1. Convert the analogue filter with system function

$$H(s) = \frac{s+0.1}{(s+0.1)2 + 16}$$

into a digital IIR filter by means of bilinear transformation. The digital filter is to have a resonant frequency of $W_r=\pi/2$.

2. State true or false and justify." The physically realizable and stable IIR filter can not have a linear phase.
3. Compare Impulse invariant and bilinear transformation method in IIR Filter design.
4. Design a Chebyshev-I bandstop digital filter with the following specifications:

   Passband range: 0 to 275 Hz and 2KHz to ∞

   Stopband range: 550 Hz to 1000 Hz

   Sampling Frequency : 8 KHz

   Passband attenuation (αp)= 1 dB.

   Stopband attenuatiop (αs)= 15 dB.

   Use BLT and Assume T=1 sec.

5. Design a Butterworth, digital lowpass filter for following specifications. Plot pole-zero plot also. Use bilinear transformation (BLT) method :

(i)	Passband	0 – 1 KHz
(ii)	Stopband	3 KHz – onwards
(iii)	Passband attenuation	2·3 dB
(iv)	Stopband attenuation	18 dB
(v)	Sampling frequency	12 KHz
(vi)	Low-pass filter	
(vii)	Plot pole-zero plot of analog filter only.	

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors

Chapter No. : 4

Chapter Name : FINITE WORD LENGTH EFFECTS IN DIGITAL FILTERS

Approximate Time Needed : 07 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
36	Number Representation
37	Quantization, Truncation and Rounding Effects
38	Quantization Errors
39	Cycle Oscillations
40	Quantization in floating point realization IIR digital filter
41	Finite word length effects in FIR Digital Filters
42	Quantization effects in computation of DFT and FFT

Objectives:

1. Provide an understanding of the errors that arise in practical DSP systems due to quantization and use of finite word length arithmetic
2. Study the effect of errors on signal quality.
3. Study the effects of finite word length arithmetic in DFT algorithms and digital filters
4. Analyze the existence of limit cycles in digital filters;

Lesson Outcomes

Evaluate the effects of finite word length arithmetic in DFT and digital filters;

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors

Chapter No. : 5

Chapter Name : INTRODUCTION TO DSP PROCESSORS

Approximate Time Needed : 06 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
43	Introduction to Fixed Point and Floating point DSP Processor
44	MAC, Modified Bus Structures, Memory Access schemes
45	VLIW Architechture
46	Features of TMS321c67xx
47	Architechture of TMS321c67xx
48	External Interfacing

Objectives:

To study DSP processors

Outcomes:

The students will

1. Understand the need of DSP Processor
2. Gain knowledge of various DSP Processors
3. Appreciate the advantages and disadvantages of DSP processor as compared with microprocessors.

Model Questions:

Dec 2011

With the help of neat block diagram explain any one DSP processor in detail. 7

Write short notes on [illegible]

June 2011

1. Draw a block diagram TMS320C54XX series architecture and discuss its function and capabilities.
2. What is the need for DSP processor when high speed Pentium processors are available ?

June 2010

With a block diagram, explain the aschitecture of TMS 320C5 × series of **10** processors.

Chapterwise Plan

Subject Title: Digital Signal Processing and Processors
Chapter No. : 6 Chapter Name : APPLICATION OF DSP PROCESSORS Approximate Time Needed : 04 hrs
Lesson Schedule :

Lecture No.	Portion covered per hour
49	Speech Processing
50	Speech Processing
51	Radar Signal Processing
52	Radar Signal Processing

Objectives:

To make students aware of wide range of application areas for DSP.

Lesson Outcomes:

The students will become cognizant with various applications of DSP

Model Questions:

1. Application of DSP for Speech Processing
2. Application of DSP for Radar Processing

EXERCISE 1

This is a MATLAB exercise. Read the audio file “laughter" using the Matlab command load laughter. You will have the data vector y and the sampling frequency Fs in your workspace. You can use the command whos to see that. Listen to the audio _le by using the Matlab command sound. (As a general rule, if you want to know how to use a Matlab function, type help function name, e.g. help sound).

(a) Downsampling

Perform downsampling of the audio file by a factor of M = 4. At the first step, downsample y using a simple compressor. In other words, keep every M-th sample of y. Let's call this approach “naive downsampling". Listen to the result using the function sound. Don't forget to pass a proper sampling frequency in the function. In the next step, perform low pass filtering of y before using the compressor. You need to reduce the bandwidth of y by a factor of M. To implement the low pass filter, use the command h=fir1(256,1/M,'low'). To perform the low pass filtering, use the command yd=filter(h,1,y). Listen to the result. You can multiply the result in both cases by a factor (say 4) to understand the results better. Do you find any difference? Provide your conclusions along with your Matlab code.

(b) Upsampling

Perform upsampling of the audio signal by a factor of L = 4. At the first step, upsample y using an expander. In other words, insert L-1 zeros between each pair of consecutive samples. Let's call this approach “naive upsampling". Listen to the result (Again, don't forget to pass the proper sampling frequency in the function sound). At the next step, perform low pass filtering after using the expander. To implement the low pass filter, use the command h=fir1(256,1/L,'low'). Listen to the result. Do you find any difference? Provide your conclusions along with your Matlab code.

EXERCISE 2

This is a MATLAB exercise. Load the image "cameraman.tif" using the MATLAB command imread. Convert it to double precision value using the MATLAB command double. Make a Gaussian filter of size 15 χ15 of standard deviation 2, using the MATLAB command fspecial. Filter the image with the filter using the command imfilter using periodic boundary condition. Visualize the resulting image. How is it different from the original image?

Next, extend the filter to the size 256_256 by padding zeros, and then apply circular shift to the result to make it zero phase. Specifically, if h be the filter obtained in the first part, you need to perform

H=zeros(256);

H(1:15,1:15)=h;

H=circshift(H,[-7,-7]);

Take the two dimensional discrete Fourier transform (2-D DFT) of the filter H using the MATLAB command fft2. Multiply the 2-D DFT of the filter with the 2-D DFT of the image and take the inverse 2-D DFT using the MATLAB command ifft2. Visualize the resulting image. Compare the image with the output of the first part of the problem. Provide your MATLAB code and also the images in the two cases along with your comments.

Assignments

ASSIGNMENT 1 (DATE : 9th FEB 2015)

1. Find the number of complex addition and complex multiplication required in calculating 256 point DFT of a sequence using direct computation and using FFT algorithm

2. Find DFT of the following sequence by calculating DFT only once
   a. x1(n) = {1,2,3,4} and x2(n) = {5,6,7,8}

3. Using DFT / IDFT method, find response of the system with impulse response
   a. h(n) = 2 δ(n) + 5 δ(n-1)
   b. x(n) = 2 δ(n) + 3 δ(n-1) + 5 δ(n-2)

4 Find DFT of the sequence x(n) = { 1, 2, 3 4 } and using this result and not otherwise. Find DFT of
x1(n) = {1, 0, 2, 0, 3, 0, 4, 0 }
x2(n) = {1, 2, 3, 4, 1, 2, 3, 4 }

5 Find DFT of the following sequence using FFT
x(n) = {1, 1, 1, 0, 0, 0, 1, 1}

6 Using the results derived in (a) and not otherwise, find DFT of the signal
x1(n) = { 1, 0, 0, 0, 1, 1, 1, 1 }
x2(n) = { 1, 1, 1, 1, 1, 0, 0, 0 }

7 Consider sequence x(n) = {1,2,1,2,0,2,1,2}. Determine DFT using DIFFFT.

ASSIGNMENT 2 (DATE : 13th March 2015)

FH 2015

BASIC VLSI

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Mrs.GOMATHI M.

Mrs. DEEPALI BHOSALE

Subject Plan

GROUP NAME : INTEGRATED CIRCUITS
COURSE TITLE : Basic VLSI **COURSE CODE : TE** **SEM : VI (FH 2015)**
PRE-REQUISITE : Integrated circuits, Digital circuits design.

RATIONALE

The basic building blocks of VLSI circuits are MOSFETs or/and BJTs. This subject deals with MOSFET based VLSI design. A detailed comparison between MOSFET and BJT characteristics is this included. A set of parameters of the basic building blocks (e.g. MOSFETs) describing the electrical characteristics as a function of operating conditions and geometrical parameters are to be provided for circuit design. These parameters are known as model parameters and are dealt with by a subject known as MOSFET modeling.

OBJECTIVES :

- To familiarize students with the different aspects of the VLSI field and to introduce important concepts that have industry value.
- To teach fundamental principles of VLSI circuit design and layout techniques, and to high light the circuit design issues in the context of VLSI technology.

OUTCOMES :

The student should be able to

1.To use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnect.

2. To create models of moderately sized CMOS circuits that realizes specified digital functions.

3. To apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect, and to verify the functionality, timing, power, and parasitic effects.

4. To have an understanding of the characteristics of CMOS circuit construction and the comparison between different state-of-the-art CMOS technologies and processes.

5. To complete a significant VLSI design project having a set of objective criteria and design constraints.

6. To demonstrate the fundamentals of IC technology such as various MOS fabrication technologies

7.To calculate electrical properties of MOS circuits such as Ids -Vds relationship, gm, figure of merit, sheet resistance, area capacitance.

7. To design various gates, adders, Multipliers, Memories, using stick diagrams, layouts.

9. To demonstrate semiconductor IC design such as PLA's, PAL, FPGA, CPLD's

Course instructional objectives & outcomes

6. Syllabus

7. Chapter-wise Question Bank

Evaluation :

Theory Exam	80 M
Internal assessment:-. The average marks of Mid-term test (20 M) & End-term test (20 M) will be considered as final IA marks	20 M
Oral	25 M
Term Work	25 M
Total	150 M

List of Experiments

Expt. No.	Name of the Experiments
1	Study of Resistive loaded NMOS in enhancement.
2	Study of CMOS inverter
3	Study of 4bit full adder
4	Study of 4 bit CLA
5	VTC characteristics of NMOS
6	Study of Multiplier circuit

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 1

Chapter Name :Technology trend

Approximate Time Needed : 6 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Comparision of BJT,NMOS,and CMOS technology
2	MOSFET level1 and level2 model
3	MOSFET modeling
4	Concepts of MOSFET scaling.
5	MOSFET capacitances
6	Scaling types

Objectives:

9. The goal of the course is to introduce architecture and design concepts underlying modern complex VLSIs and system-on-chips
10. The lectures build upon students prior knowledge of digital circuits, digital logic, and computer architecture concepts to teach how complex chip-scale systems can be designed.

11. The concurrent labs make the students apply the concepts learnt in the lectures towards design of actual VLSI subsystems from high level specifications, and culminates in a course project involving the hardware-software design of a modest complexity chip all the way from specification, modeling, synthesis, and physical design

Lesson Outcome:

Students will able to

1. Synthesis of digital VLSI systems from register-transfer or higher level descriptions in hardware design languages
2. Several lab team assignments to design actual VLSI subsystems from high level specifications, culminating in a course project involving the hardware-software design of a modest complexity chip all the way from specification, modeling, and synthesis.

3. Design for test - basic concepts, fault models (stuck-at) for combinational circuits, fault equivalence and dominance, test-vector generation, scan-path based testing.

Model Questions:

Write short notes on :-

(a)BJT,NMOS and CMOS

(b)MOSFET scaling types.

(c)MOSFET models.

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 2

Chapter Name : MOSFET Inverters

Approximate Time Needed : 10 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
7	Static and dynamic analysis
8	Static and dynamic analysis of resistive load and CMOS inverter
9	CMOS inverter
10	CMOS inverter types
11	MOS inverters
12	MOS inverters types and design.
13	CMOS latch-up
14	Design of CMOS latch up cicuits
15	Analysis and design of 2I/P NAND and NOR using CMOS inverter
16	Analysis and design of 2I/P NAND and NOR using CMOS inverter

Objectives:

1.comparision of all types of MOS inverters.

2. analysis and design of 2I/P NAND and NOR.

3. To describe the C-MOS latch-up characteristics

4. To describe the CMOS inverter

Lesson Outcomes:

The student will be able to

1. Design CMOS logic using MOSFET devices
2. Perform circuit-level simulation of CMOS logic gates to determine noise propagation delay and power dissipation
3. Characterize MOSFET devices.

Model Questions:

1,Static and Dynamic analysis of resistive load and CMOS inverters

2.Design of CMOS inverters

3.Analysis of 2 I/P NAND and NOR

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 3

Chapter Name :MOS circuit design analysis

Approximate Time Needed : 10 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
17	Pass transistor logic
18	Transmission gate design analysis
19	Pseudo NMOS design style
20	DOMINO
21	NORA
22	Zipper
23	C^2 MOS
24	sizing using logical effort 10.Circuit realization(F/F,SR,MUX)
25	sizing using logical effort 10.Circuit realization(F/F,SR,MUX)
26	Pseudo NMOS design style

Objectives:

1.Students can analyze basic building blocks of analog and digital microelectronics circuits and systems.

2Students will apply circuit theory and use commercial EDA tools to design CMOS analog and digital circuits.

Lesson Outcomes:

Students will be able to design and analyze combinatorial and sequential logic gates and

1.will learn transistor sizing for digital performance.

2. Students will be able to design and analyze, with Bode plots, the mid band and high frequency response of common source, common gate, source follower, cascode, and differential amplifiers.

3. Students will analyze Miller effect and its use in compensation.

Model Questions:

- Write short notes on circuit realization using F?F and shift register
- Explain the design style of Pseudo NMOS and NORA
- Explain: DOMINO,Zipper
- Write a short note on static CMOS design styles

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 4

Chapter Name : Semiconductor Memories

Approximate Time Needed : 08 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
27	SRAM design leakage current
28	Decoder
29	ROM array design and read/write circuits.
30	DRAM operation modes
31	DRAM input/output circuits
32	NOR Flash mechnanism
33	NAND Flash
34	Sense amplifier

Objectives:

- Semiconductor Read-Only Memories (ROMs)
- A Basic Diode ROM
- A Diode ROM with Internal Decoding
- Semiconductor ROM Characteristics
- ROM Types

- ROM Applications
- ROM Testing
- Semiconductor Read/Write Memories (RWMs)
- SAMs versus RAMs
- RAM Types
- RAM Applications
- RAM Testing

Lesson Outcomes

Students will be able to understand and analyze

- power consumption
- packing density
- speed of operation
- internal organisation
- interface requirements
- methods of storage
- cost of semiconductor memories

Model questions:

- Write short notes on Flash mechanism
- Explain the principle of DRAM
- Explain :leakage currents and refresh operation
- Draw and explain the block diagram of sense amplifier circuits.
- Write a note on ROM array

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 5

Chapter Name : Data path design

Approximate Time Needed : 08 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
35	Bit adder circuit
36	Ripple carry adder
37	CLA adder
38	Partial product generation
39	Partial product accumulation.
40	Barrel shifter.
41	Final addition
42	overview of data path design

Objectives:

The goal of the course is to introduce architecture and design concepts underlying modern complex VLSIs and system-on-chips. The lectures build upon students prior knowledge of digital circuits, digital logic, and computer architecture concepts to teach how complex chip-scale systems can be designed.

Outcomes:

After this chapter the students should have knowledge about the following concepts

1. adder circuits its various
2. Difference between mulitiplier and shifter.
3. Concepts of CLA adder

Model questions:

- Write short notes on barrel shifter
- Explain about CLA adder
- Explain the principle of partial product generation and accumulation
- Short notes on ripple carry adder

Chapterwise Plan

Subject Title: Basic VLSI Design

Chapter No. : 6

Chapter Name : VLSI clocking and system design

Approximate Time Needed : 10 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
43	Basic concepts of CMOS clocking styles
44	clock generation
45	stabilization and distribution
46	various components of power dissipation in CMOS.
47	various components of power dissipation in CMOS.
48	limits on low power design
49	Voltage scaling
50	ESD protection
51	switching noise
52	power distribution scheme, interconnect scaling and cross talk.

Objectives:

To make students aware of wide range of application and power dissipation in CMOS.

Lesson Outcomes:

The students will become cognizant with various applications and interconnect scaling methods.

Model Questions:

- Write short notes on interconnect delay model
- Explain the principle of clocking styles
- Explain about the various components of power dissipation in CMOS
- Write sort notes on power distribution scheme

Assignments

ASSIGNMENT 1 (DATE : 9th FEB 2015)

1.Differentiate according to technology trends BJT,NMOS and CMOS

2.Explain MOSFET scaling types and MOSFET models.

3.Explain the Design of CMOS inverters

4.Explain with neat circuit diagram, Analyse 2 I/P NAND and NOR

5.Explain: DOMINO,Zipper

6.Write a short note on static CMOS design styles

Assignments

ASSIGNMENT 2 (DATE : 13th March 2015)

1. Give & explain carry save adder

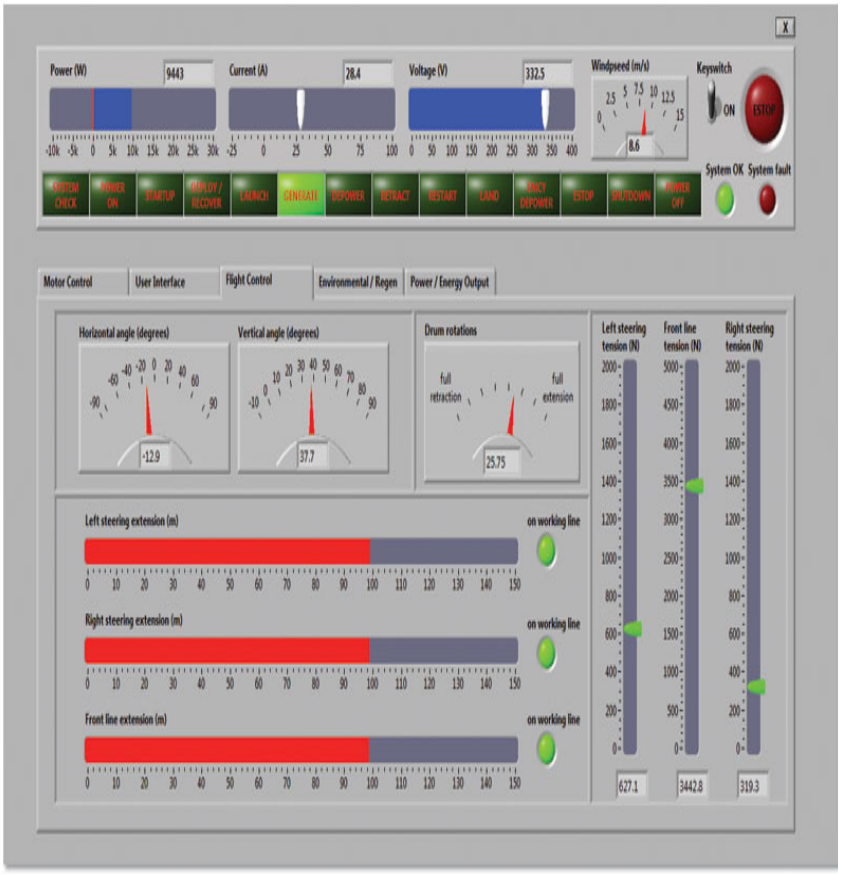
2. Draw 1T DRAM cell and explain its write, read , hold and refresh operation .

3. Explain various technique of clock generation . Discuss “H” tree clock distribution

4. Interconnect scaling

5. Draw schematic for 6T SRAM cell and explain its stability criteria. Also draw and discuss butter-fly curve

6. Discuss in programming techniques of EEPROM in details.



FH-2015

ADVANCED INSTRUMENTATION SYSTEMS

PADMABHUSHAN VASANTDADA PATIL PRATISHTHAN'S
COLLEGE OF ENGINEERING
SINCERITY
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Empower The Knowledge

Mrs. JAYSHREE PAWAR

Mrs.KHUSHBOO SINGH

Subject Plan

GROUP NAME : INSTRUMENTATION SYSTEM
COURSE TITLE : Advanced Instrumentation System **COURSE CODE : EXC 602** **SEM : VI (FH 2015)**
PRE-REQUISITE : Electronics Instruments & Measurements

RATIONALE

This second course in instrumentation system group aims to introduce the student with the concept of advancement in instrumentation, which include data acquisition, data logging, telemetry & basic requirements of control system & components. It also covers introduction to Pneumatic and Hydraulic components. This course also aims to give the basic idea of Transmitters and Converters, Process Control Valves, Controllers and Controller Tuning.

OBJECTIVES:

1. To understand basic functions and working of Pneumatic and Hydraulic components used in Instrumentation Process System.
2. To understand principles of process parameter transmission and conversion of process parameters to electrical and vice versa
3. To become familiar with control system components and their application in process control.
4. To understand various controllers used in process control and the tuning methods of controllers.

OUTCOMES:

1. Students will be able to understand the basic functions and working of Pneumatic and Hydraulic comments.
2. Understand principle of process parameter transmission and conversion of process parameters to electrical and vice versa
3. Student will get familiar with control system components and their application in process control.

4. Understand various controller used in process control and the tuning methods of controllers.

LEARNING RESOURCES: -

RECOMMENDED BOOKS: -

1. Bella G. Liptak, "Process Control and Optimization, Instrument Engineer's Handbook", 4th Edition, CRC Press
2. WG Andrews and Williams, "Applied Instrumentation in the process Industries, Vol. – I and II", Gulf Publication
3. Terry Barlett, "Process Control System and Instrumentation", Delimar Cengage learning Reprint-2008
4. Andrew Parr, "Hydraulics And Pneumatics- A Technician's And Engineer's Guide", Jaico Publishing House, Mumbai
5. C.D.Johnson, "Process Control and Instrument Technology", Tata Mcgraw Hill.
6. J. W. Hatchison, "ISA Handbook of Control Valves", 2ndEdition, ISA, 1990.

COURSE MATERIALS MADE AVAILABLE

1. Course instructional objectives & outcomes
2. Syllabus
3. Chapterwise Question Bank

Evaluation :

List of

Theory Exam	80 M
Internal assessment:-. The average marks of Mid-term test (20 M) & End-term test (20 M) will be considered as final IA marks	20 M
Practical & Oral	25 M
Term Work	25 M
Total	150 M

Experiments

Atleast 10 experiments based on the entire syllabus

Expt. No.	Name of the Experiments
1	To study SCR characteristics. Also calculate values of holding & lacking currents.
2	To study Diac & Triac characteristics. Also calculate breakover voltage of Diac & Triac.
3	Application of Diac & Triac as light dimmer & fan regulator
4	To study single phase half controlled rectifier with R load
5	To study full controlled rectifier with R & R-L load
6	To perform the measurement of inductance , capacitance & resistance of given component by Q-meter
7	To study RTD, Thyristors, thermocouple- their range & its application.
8	To perform the frquency
9	To perform the characteristics of LVDT & determine its resistivity
10	To perform the strain measurement using strain gauge

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 1

Chapter Name : Concepts of Advancement in Instrumentation

Approximate Time Needed : 06 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Introduction
2	Data acquisition system
3	Data logging
4	Telemetry in measurement
5	Basic requirement of control system
6	Basic components of control system

Objectives:

1. Become familiar with the data acquisition system.
2. Understand the data logging process
3. Learn the function of telemetry in measurement.
4. Study the requirement of control system & analyze the components of control system.

Lesson Outcome:

Students will able to

1. Understand the data acquisition system & data logging process.
2. Gain knowledge of telemetry in measurement.

3. Understand the requirement of control system & its basic components.

Model Questions:

JUNE 2014

1. What is signal conditioning?Why is it necessary in Data Acquisition System?
2. Explain multichannel Data Acquisition System to monitor temperature,pressure and displacement measurement.

DEC 2013

1. Explain a basic Data Logger with a block diagram.
2. Draw and explain multichannel Data Acquisition System.

DEC 2012

1. Explain multichannel Data Acquisition System to monitor temperature, pressure and displacement measurement.
2. Explain a basic Data Logger with a block diagram. Differentiate between data logger and Data Acquisition System.

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 2

Chapter Name : Pneumatic

Approximate Time Needed : 12 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	ISO symbols, pneumatic air supply system
2	Air compressors, pressure regulation devices
3	Directional control valves
4	Special types of pneumatic valve: pilot-operated valves
5	Non-return valves, flow control valves and sequence valves
6	Time delay valve
7	Single and double acting linear actuators
8	Special type of double acting cylinder
9	Rotary actuators, air motors
10	Process control pneumatics: flapper nozzle system, volume boosters & air relays
11	Pneumatic transmitters & controllers, pneumatic logic gates
12	Dynamic modelling of pneumatic circuits

Objectives:

1. Become familiar with the ISO symbols, pneumatic air supply system, air compressors, pressure regulation devices & directional control valves.

2. Understand special types of pneumatic valve.
3. Learn the function of single & double acting linear actuators, rotary actuators & air motors.
4. Study the Process control pneumatics.

Lesson Outcome:

Students will able to

1. Understand the ISO symbols & pneumatic systems.
2. Comprehend special types of pneumatic valve.
3. Learn actuators & process control pneumatics.

Model Questions:

1. Explain the working of strain gauge .Derive the expression of gauge factor for metal strain gauge .Also compare semiconductor strain gauge with metal strain gauge.
2. Explain capacitive type of pressure transducer, with neat diagram.
3. Draw and explain pressure sensing elements.
4. Discuss one of the technique of measurement of high and low pressure measurement each

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 3

Chapter Name : Hydraulic Components

Approximate Time Needed : 06 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Hydraulic pumps, Pressure regulation method
2	Loading valves
3	Hydraulic valves and actuators
4	Speed control circuits for hydraulic actuators
5	Selection and comparison of pneumatic

Objectives:

1. To understand basic functions and working of Hydraulic components used in Instrumentation Process System.
2. To emphasize on speed control circuits for hydraulic actuators & compare and select pneumatic

Lesson Outcome:

Students will able to

1. Understand basic functions and working of Hydraulic components
2. Gain knowledge of t on speed control circuits for hydraulic actuators &
3. Compare and select pneumatic

Model Questions:

1. Explain hydraulic pumps.
2. Briefly explain pressure regulation methods.
3. What are hydraulic valves & actuators?
4. Explain the speed control circuits for hydraulic actuators

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 4

Chapter Name : Transmitters and Converters

Approximate Time Needed : 12 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Electronic versus pneumatic transmitters,
2	2 - wire; 3 -wire and current transmitters.
3	4 -wire current transmitters
4	Electronic type: temperature, pressure.
5	Differential pressure ,level .
6	Flow transmitters
7	Applications.
8	Smart (Intelligent) transmitters.
9	Buoyancy transmitters
10	Applications.
11	Converters :Pneumatic to Electrical
12	Electrical to Pneumatic converters

Objectives:

1. To understand principles of process parameter transmission and conversion of process parameters to electrical and vice versa.
2. To become familiar with control system components and their application in process control.

3. Learners are expected to understand various controllers used in process control and the tuning methods of controller device while designing a circuit.
4.

Model Questions:

1. Explain in detail ON-Off controller. Describe the importance of dead zone.
2. Write short notes on:Current to voltage converters .
3. Explain distributed control system with neat diagram.
4. Draw and explain the block diagram of multichannel DAS for temperature, pressure and force measurement .
5. Write short notes on:Composite controller.

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 5

Chapter Name : Process Control Valves

Approximate Time Needed : 08 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Globe, ball, needle, butterfly type control valves.
2	Diaphragm, pinch, gate, solenoid, smart control valves. Special designs of globe valves.
3	Flow characteristics, control valve parameters, control valve capacity ,valve range ability.
4	Turn – down ,valve size,valve gain.
5	Selection criteria , specifications and installation of control valves.
6	Valve Positioners :Necessity, types -motion balance .Force -balance, effect on performance of control valve.
7	Control Valve Actuators : Electrical, pneumatic, hydraulic
8	Electro-mechanical,digital actuators. Selection criteria of Valve actuators

Objectives:

1. To understand principles of process parameter transmission and conversion of process parameters to electrical and vice versa.
2. To become familiar with control system components and their application in process

control.

3. Learners are expected to understand various controllers used in process control and the tuning methods of controller device while designing a circuit.

Model Questions:

1. Explain in detail the construction , working principle and operation of electromagnetic type flow meter.
2. Explain distributed control system with neat diagram.
3. Draw and explain the block diagram of multichannel DAS for temperature, pressure and force measurement .
4. Write short notes on: Composite controller.

Chapterwise Plan

Subject Title: Advanced Instrumentation System

Chapter No. : 6

Chapter Name : Controllers and Controller Tuning

Approximate Time Needed : 08 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Continuous and discontinuous controller
2	Proportional controller
3	RESET controller
4	Rate controller
5	Composite controller
6	Cascade controller
7	Feed –forward controller
8	Need and different method of controller tuning

Objectives:

1. To become familiar with control system components and their application in process control.
2. Learners are expected to understand various controllers used in process control and the tuning methods of controller device while designing a circuit.

Model Questions:

1. Draw and Explain in detail PID Controller
2. Explain distributed control system with neat diagram.

3. Write short notes on:Controller tuning.
4. What is feed forward controller? Discuss with suitable industrial example.
5. Explain in detail cascade controller with block diagram and suitable example.
6. Write short notes on: Composite controller.

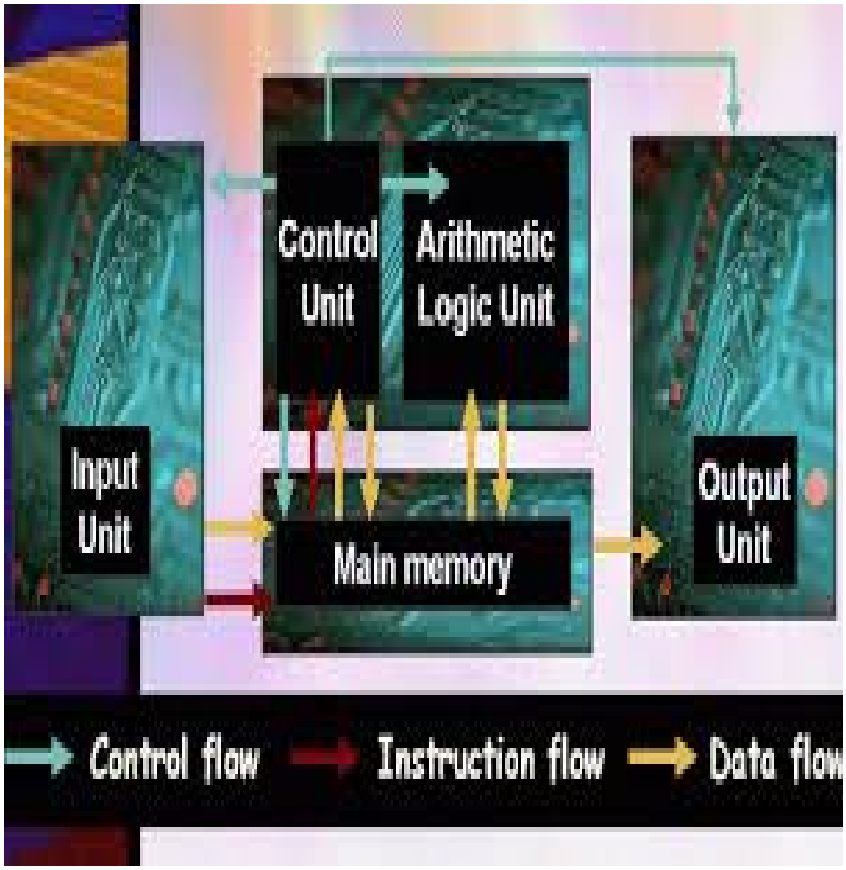
Assignments

ASSIGNMENT 1 (DATE : 5th FEB 2015)

1. Explain multichannel Data Acquisition System to monitor temperature, pressure and displacement measurement.
2. Explain a basic Data Logger with a block diagram. Differentiate between data logger and Data Acquisition System.
3. Explain in detail the construction , working principle and operation of electromagnetic type flow meter.

ASSIGNMENT 2(DATE : 5th MARCH 2015)

1. Explain in detail the construction , working principle and operation of electromagnetic type flow meter.
2. Explain distributed control system with neat diagram.
3. Draw and explain the block diagram of multichannel DAS for temperature, pressure and force measurement .



FH-2015

COMPUTER ORGANIZATION

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Empower The Knowledge

Mrs.RADHA WANODE

Subject Plan

GROUP NAME: ELECTRONIC DEVICES & CIRCUITS
COURSE TITLE:Computer Organization **COURSE CODE: EXC 603** **SEM : VI(FH 2015)**
PRE-REQUISITE : Fundamentals of Microprocessor Architecture, Memory interfacing

OBJECTIVES:

1. To have thorough understanding of the basic structure & operation of a digital computer.
2. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point & floating –point addition, subtraction, multiplication & division.
3. To understand and apply methods for evaluating and comparing processor Performance
4. To gain a detailed understanding of processor implementation for a given instruction set architecture.
5. To gain an understanding of memory organization and the memory hierarchy.
6. To understand the interconnection of CPU, memory, and I/O.
7. To prepare the students to excel in post graduate studies.
8. To understand the key skills of constructing cost-effective computer systems

OUTCOME:

The student should be able to

1. Be familiar with the history and development of modern computers,
2. Be familiar with the Von Neumann architecture,
3. Be familiar with the functional units of the processor such as the register file and Arithmetic logical unit,
4. Be familiar with the basics of systems topics: single-cycle (MIPS), multi-cycle (MIPS), parallel, pipelined, super scalar, and RISC/CISC architectures.
5. Be familiar with the cost-performance issues and design trade-offs in designing and constructing a computer processor including memory.

6. Be familiar with the quantitative performance evaluation of computer systems,
7. Be familiar with the cache subsystem,
8. Be familiar with assembly language programming,
9. Be familiar with the representation of data, addressing modes, instructions sets,
10. Be familiar with the basic knowledge the design of digital logic circuits and apply to computer organization.
11. To prepare the students to excel in post graduate exams.

LEARNING RESOURCES: -

RECOMMENDED BOOKS:-

1. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization”, Fifth Edition, Tata McGraw-Hill.
2. John P. Hayes, “Computer Architecture and Organization”, Third Edition.
3. William Stallings, “Computer Organization and Architecture: Designing for Performance”, Eighth Edition, Pearson.
4. B. Govindarajulu, “Computer Architecture and Organization: Design Principles and Applications”, Second Edition, Tata McGraw-Hill.
5. Dr. M. Usha and T. S. Srikanth, “Computer System Architecture and Organization”, First Edition, Wiley-India.
6. Ramesh Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”, Fifth Edition,Penram

COURSE MATERIALS MADE AVAILABLE

1. Course instructional objectives & outcomes
2. Syllabus
3. Chapter wise Question Bank

Evaluation:

Theory Exam	80 M
Internal assessment:-. The average marks of Mid-term test (20 M) & End-term test (20 M) will be considered as final IA marks	20 M
Total	100 M

Chapter wise Plan

Subject Title: Computer organization

Chapter No. : 1

Chapter Name : Introduction to Computer Organization

Approximate Time Needed : 10 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Fundamental units of computer organization
2	Evolution of computers
3	Von- neumann model
4	Performance measure of computer architecture
5	Introduction to buses
6	connecting I/O devices to CPU and Memory
7	Bus structure
8	Introduction to number representation methods
9	Integer data computation
10	Floating point arithmetic.

Objectives:

1. Learn how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs.
2. A student should be able to articulate design issues in the development of processor or other components that satisfy design requirements
3. Experience use of design tools to model various alternatives in computer design
4. Understand the merits and pitfalls in computer performance measurements.
5. Students should be able to solve basic binary math operations using the computer.

Model Questions:

1. Explain single bus and multiple bus organization.
2. Explain different types of buses used in computer communication.
3. Explain Von- neumann model

Chapter wise Plan

Subject Title: Computer organization

Chapter No. : 2

Chapter Name : Processor Organization and Architecture

Approximate Time Needed : 14 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
11	CPU Architecture, register organization
12	Instruction formats, basic instruction cycle
13	Instruction interpretation and sequencing
14	Control unit: soft wired (micro-programmed)
15	Hardwired control unit
16	Design methods
17	Microinstruction sequencing and execution
18	Micro operations
19	Concepts of nano programming.
20	Introduction to RISC and CISC architectures and design issues
21	Case study on 8085 microprocessor, features
22	Architecture,
23	pin configuration
24	Addressing modes

Objectives:

1. Understand the impact of instruction set architecture on cost-performance of computerdesign.
2. Analyse architectures and computational design.
3. Reason systematically about impact of design parameters and alternatives on key costs (energy, delay, area, reliability, complexity)

4. Students should be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target computer.
5. Students will understand the relationship between hardware and software specifically how machine organization impacts the efficiency of applications written in a high-level language.
6. Students will be able to explain the fetch-execute cycle performed by the CPU and how the various components of the data path are used in this process.

Model Questions:

1. Compare RISC and CISC architecture.
2. Compare horizontal microprogramming with vertical microprogramming
3. Write microinstruction for the instruction Add R0,[R3].
4. Draw a block schematic of micro programmed control unit and explain in brief.
5. Explain various methods of micro program sequencing.

Chapter wise Plan

Subject Title: Computer organization
Chapter No. : 3 Chapter Name : Memory Organization Approximate Time Needed : 12 hrs
Lesson Schedule :

Lecture No.	Portion covered per hour
25	Introduction to memory and memory parameters
26	Classifications of primary and secondary memories
27	Types of RAM and ROM
28	Allocation policies
29	Memory hierarchy and characteristics
30	Cache memory concept, architecture (L1, L2, L3)
31	Mapping techniques
32	Cache coherency
33	Interleaved and associative memory
34	Virtual memory
35	Segmentation and paging
36	Page replacement policies

Objectives:

1. Understand alternatives in cache design and their impacts on cost/performance
2. Understand memory hierarchy and its impact on computer cost/performance.

Model Questions:

1. Write short note on Cache architecture.
2. Explain various page replacement policies.
3. Explain various characteristics of memory.
4. What is the necessity of replacement algorithm?
5. Show how pages are replaced between cache memory and main memory using replacement policies.

Chapter wise Plan

Subject Title: Computer organization

Chapter No. : 4

Chapter Name : Input / Output Organization

Approximate Time Needed : 08 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
37	Types of I/O devices and access methods
38	Types of buses and bus arbitration,
39	I/O interface, serial and parallel ports
40	Types of data transfer techniques
47	Programmed I/O
48	Interrupt driven I/O and DMA
49	Introduction to peripheral devices, scanner, plotter, joysticks, touch pad
50	Storage devices

Objectives:

1. To design electrical circuitry to the processor I/O ports in order to interface the processor to external devices.
2. To understand the communication of external devices.

Model Questions:

1. Explain modes of DMA transfer.
2. What is bus arbitration?
3. Explain the different techniques for bus arbitration.

Chapter wise Plan

Subject Title: Computer organization
Chapter No. : 5 Chapter Name : Introduction To Parallel Processing System Approximate Time Needed : 04 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
51	roduction to parallel processing concepts, Flynn's classifications
52	eline processing, instruction pipelining
53	eline stages
54	eline hazards

Objectives:

1. Design a pipeline for consistent execution of instructions with minimum
2. Understand ways to incorporate long latency operations in pipeline design
3. Understand ways to take advantage of instruction level parallelism for high performance processor design.

Model Questions:

1. Explain how processor performance can be enhanced by using pipelining.
2. Explain the various types of hazards in pipelined processors with example.
3. What is pipelining? Show the example with 5 stage pipelined architecture.
4. Explain data hazard and code hazard in pipelining.

Chapter wise Plan

Subject Title: Computer organization
Chapter No. : 6 Chapter Name : Introduction to Intel IA32 Architecture Approximate Time Needed : 04 hrs
Lesson Schedule :

Lecture No.	Portion covered per hour
55	el IA32 family architecture, register structure
56	dressing modes
57	vancements in arithmetic and logical instructions
58	ception handling in IA32 architecture

Objectives:

1. Understand the addressing modes, register structure of Intel
2. Understand the Intel architecture.

Model Questions:

1. Explain the various expectations and how exception handling is performed in IA-32 architecture.
2. Explain Pentium addressing modes with suitable examples.
3. Draw and explain register structure IA-32 family.
4. Draw and explain IA-32 architecture.

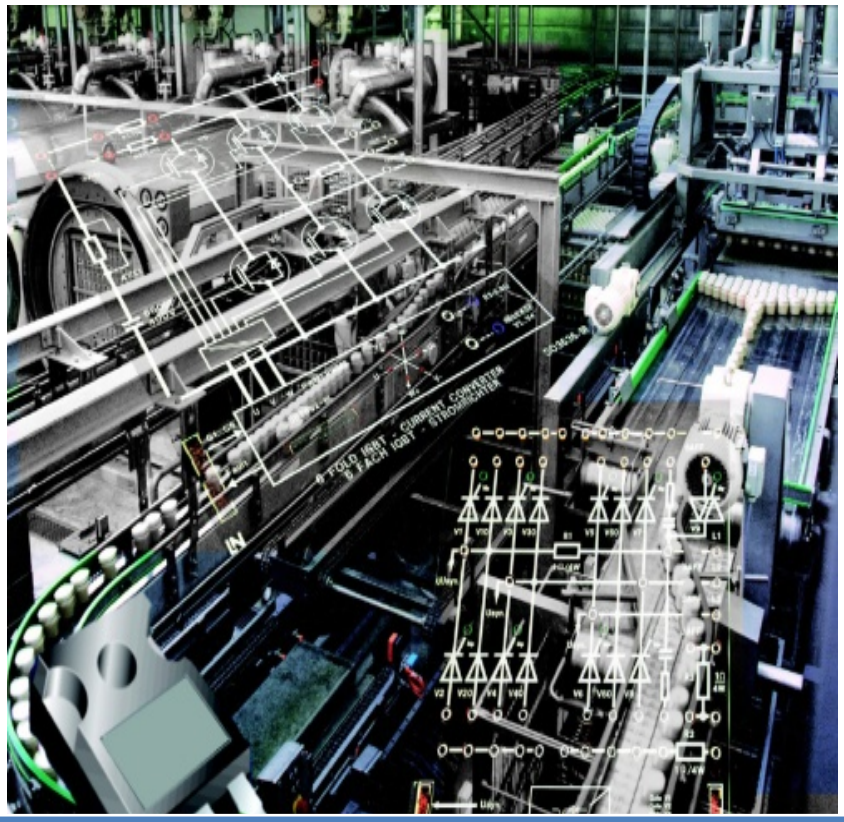
Assignments

ASSIGNMENT 1 (DATE: 9th FEB 2015)

1. Compare horizontal microprogramming with vertical microprogramming
2. Write microinstruction for the instruction Add R0, [R3].
3. Explain various methods of micro program sequencing.
4. Write short note on Cache architecture.
5. Explain various page replacement policies.
6. Explain various characteristics of memory.
7. What is the necessity of replacement algorithm?
8. Write short note on virtual memory.

ASSIGNMENT 2 (DATE: 9th March 2015)

1. Explain the various expectations and how exception handling is performed in IA-32 architecture.
2. Explain Pentium addressing modes with suitable examples.
3. Explain the various types of hazards in pipelined processors with example.
4. Explain the different techniques for bus arbitration.
5. Explain bus arbitration techniques.



FH-2015

POWER ELECTRONICS & DRIVES

Mrs.JAYSHREE PAWAR

Subject Plan

GROUP NAME:Power Electronics
COURSE TITLE:Power Electronics 1 **COURSE CODE:EXC 604** **SEM : VI(FH 2015)**
PRE-REQUISITE: Electronic Devices

RATIONALE

This course in Power Electronics group aims to introduce the student to the idea of d is the application of solid-state electronics for the control and conversion of electric power. It also refers to a subject of research in electronic and electrical engineering which deals with design, control, computation and integration of nonlinear, time varying energy processing electronic systems with fast dynamics.

It also aims to enhance knowledge and understanding of power electronic converters and their application in power electronic systems.To enhance knowledge and understanding of power electronic devices and their application in power electronic converters.To provide students with the skills and techniques necessary to analyze and synthesize power electronic circuits utilizing modern power electronic devices

OBJECTIVES :

10. To differentiate between signal level semiconductor devices and power level semiconductor devices.
11. To teach the basic concepts of power electronics. Also to study the important powerdevices in detail along with basic application of SCR as controlled rectifier. To get skill of developing and design related to power electronics circuits.
12. To study the ratings of different power level semiconductor devices, its cooling techniques, and applications based on the same.

13. To study the applications of power semiconductor devices for switching of high power circuits.
14. To study different types of converters, its working and applications.
15. To get an idea about turn on and turn off circuitry for different semiconductor devices.
16. To classify the devices based on their internal structure, turn on and turn off, rating and

applications.

17. To introduce different types of converters their applications and role of SCR in their operations.

OUTCOME:

1. To gain Knowledge of Difference between signal level and power level semiconductor devices.
2. Basic concepts of power electronics. The important power devices in detail and difference between them.
3. Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.
4. The use of semiconductor devices to switch on and off high power circuits.
5. Converter topologies and role of SCR in their working.
6. Firing circuits (Turn On) and commutation circuits (Turn Off) for different semiconductor devices.
7. Classification of power semiconductor devices based on their rating, internal structure, operation method used for turn on and off of the device.
8. The types of converters viz. DC-DC, DC-AC, AC_AC and applications of these converters to the DC and AC drives.

LEARNING RESOURCES: -

RECOMMENDED BOOKS:-

1. General Electric: SCR manual, USA
2. Ned Mohan: Power electronics; John Wiley Pub.
3. M.H. Rashid, Power electronics, PHI India
4. M.D. Singh and K.B. Khanchandani. Power electronics, Tata McGraw Hill
5. P.C. Sen, Power Electronics, TMH
6. Dr. P.S. Bimbhra, Power Electroics, Khanna Publications.
7. Chute and Chute: Electronics in Industry; MGH
8. B.W.Williams: Power Electronics, John Wiley, 1975

COURSE MATERIALS MADE AVAILABLE

1. Course instructional objectives & outcomes
2. Syllabus
3. Chapter wise Question Bank

Evaluation :

Theory Exam	80 M
Internal assessment:-. The average marks of Mid-term test (20 M) & End-term test (20 M) will be considered as final IA marks	20 M
Total	100 M

List of Experiments

At least 10 experiments based on the entire syllabus

Expt.No.	Name of the Experiments
1	To study SCR Characteristics.Alsocalculate values of holding and latching currents.
2	To study Diac and Traiccharacteristics.Also calculate Break over voltage of Triac and Diac.
3	Applications Of Diac and Triac as light dimmer and fan regulator.
4	To study different turn on methods of SCR.
5	To study different turn off methods of SCR
6	To study A-C power control using double R-C Network
7	To study single phase full controlled rectifier with R and RL-Load (with and without free wheeling diode).
8	To study single phase half controlled rectifier with R load.
9	To study full controlled Rectifier (semi converter) with R and R-L load (with and without Free wheeling diode).
10	Triggering Circuits: i)Ramp and Pedestal ii) cosine inverse

Chapter wise Plan

Subject Title: Power Electronics 1

Chapter No. : 1

Chapter Name : Silicon Controlled Rectifier

Approximate Time Needed :10hrs.

Lesson Schedule :

Lecture No.	Portion covered per hour
1	Principle of operation of SCR
2	Static and dynamic characteristics
3	Gate characteristics
4	Methods of turning on (type of gate signal)
5	Firing circuits (using R, R-C,UJT)
6	commutation circuit
7	Protection of SCR
8	di/dt and dv/dt ratings and protections for SCR.
9	Overvoltage and overcurrent protections for SCR.Cooling of semiconductor devices.
10	Isolation circuits using optocoupler and pulse transformer

Objectives:

The student will learn

12. Difference between signal level and power level semiconductor devices.
13. Basic concepts of power electronics. The important power devices in detail and difference between them.
14. Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.
15. Need for cooling and different methods of cooling.
16. Importance of isolation in power electronics and how it is achieved with the help of optocoulpler and pulse transformer

17. Difference between ramp and pedestal triggering, Cosine inverse, microprocessor based triggering its advantages and disadvantages.
18. Difference between natural and forced commutation as well as distinguish between voltage and current commutated circuits.

Lesson Outcome:

Students will able to

6. Firing circuits (Turn On) and commutation circuits (Turn Off) for different semiconductor devices.
7. Classification of power semiconductor devices based on their rating, internal structure, operation method used for turn on and off of the device.

Model Questions:

University Paper Questions

MAY 2012:

Q1 (b) Explain Importance of dv/dt and di/dt rating along with proper protection circuit in SCR.
Q7 (a); Write short notes on:
a) Soft start method
b) Dynamic characteristics of SCR
c) Types of cooling of power semiconductors.

June 2013:

Q1 (a); What are the minimum requirements to turn on the SCR
Q1 (b); Explain two transistor analogy of SCR
Q3 (b); Explain the series connection of SCR.What are the problem associated with these connections.

June 2014:

Q1 (b); Differentiate between gate and V-I characteristics of SCR
Q1 (d); Draw and explain the DC circuit breaker of SCR

Chapter wise Plan

Subject Title: Power Electronics 1

Chapter No. : 2

Chapter Name : Other Switching Devices

Approximate Time Needed : 08hrs.

Lesson Schedule :

Lecture No.	Portion covered per hour
11	Principle of operation, characteristics, rating and applications of:TRIAC, DIAC
12	Principle of operation, characteristics, rating and applications of:GTO,MOSFET
13	Principle of operation, characteristics, rating and applications of: IGBT and power BJT
14	Driver circuits for power transistors di/dt ratings
15	Driver circuits for power transistors dv/dt ratings
16	Protections for SCR.
17	di/dt and dv/dt ratings and protections for SCR.
18	Overvoltage and overcurrent protections for SCR.

Objectives:

9. di/dt and dv/dt ratings of SCR which will be helpful to choose a device while desiging a circuit.
10. Protection circuits for SCR to prevent damage due to overvoltage, overcurrent and excessive values of di/dt and dv/dt ratings,
11. Difference between signal level and power level semiconductor devices.
12. Basic concepts of power electronics. The important power devices in detail and difference between them.
13. Ratings of power semiconductor devices in order to design it for specific application

Lesson Outcomes:

The student will be able to

1. Basic concept of power electronics & the important power devices in detail and difference between them.
2 Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.
2. The use of semiconductor devices to switch on and off high power circuits.

Model Questions:

University Paper Questions.

June 2014:

Q1(d);Explain four modes of working principleof TRIAC

Q1(e) Compare the power BJT,MOSFET and IGBT

Q5(b) Explain the construction and working principle of IGBT with respect to formation of inversion layer and transfer characteristics.(Dec2013 Q5(b))

Q6(a) Draw equivalent circuit of UJT,draw V-I characteristics and application of UJT and explain Ujt relaxation oscillator.

June 2013:

Q6(b);Explain the working working principle ,V-I characteristics and applications of DIAC

Q7(a)Write Short Notes on:1)Power MOSFET,2)IGBT,3)GTO-SCR

Dec 2012:

Q1(a) Compare BJT ,SCR and IGBT

Q4(b)Explain full-wave AC control using TRIAC And DIAC draw waveforms.

Q6(a) Explain the construction and working principle of power MOSFET.

Chapter wise Plan

Subject Title: : Power Electronics1

Chapter No. : 3

Chapter Name : Controlled Rectifiers

Approximate Time Needed : 12hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
19	Half wave controlled rectifiers with R load.
20	Half wave controlled rectifiers with R-L load.
21	Full wave controlled rectifiers with R load (effect of source inductance not to be considered)
22	Full wave controlled rectifiers with R-L load (effect of source inductance not to be considered)
23	Half controlled rectifiers with R load (effect of source inductance not to be considered)
24	Half controlled rectifiers with R-L load (effect of source inductance not to be considered)
25	Single phase dual converter
26	Three phase half controlled rectifiers with R load only
27	Three phase fully controlled rectifiers with R load only
28	Numerical based on calculation of output voltage
29	Numerical s based on the performance parameters of all forms of the rectifiers.
30	Applications of rectifiers in the drives.

Objectives:

The student will learn

1. The different types uncontrolled, half controlled and full controlled rectifiers with detail analysis of each.
2. Comparison based on the performance parameters of each type of uncontrolled and controlled rectifiers.
3. Applications of rectifiers in drives.

Lesson Outcomes:

1. To gain Knowledge of Difference between signal level and power level semiconductor devices.
2. Basic concepts of power electronics. The important power devices in detail and difference between them.
3. Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.
4. The use of semiconductor devices to switch on and off high power circuits.

Model Questions:

University Paper Questions

June 2014:

Q3(a)Explain with neat diagram a single phase full wave half controlled bridge rectifier for a resistive load draw load voltage waveform at alpha = 120 degrees.

Q4(a) Draw and explain 3 phase fully controlled rectifier with R load ,draw various waveforms when alpha=60 degrees.

June 2013:

Q4(a) Explain 3 phase controlled rectifier for resistive load draw output wave form for firing angle alpha at 30 degrees and 60 degrees .

Q6(a) Derive the performance factor namely input displacement factor ,input power factor , DC voltage ,Voltage ratio,input current distortion factor ,input harmonic factor and voltage ripple factor for fully controlled single phase rectifier(bridge type) with R-L load.

Dec 2012:

Q4(a) A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to Id. Supply voltage is 230 V and if firing angle is maintained at pi/6.

(I) Average out put voltage.

(ii) Supply power factor.

(iii) Supply harmonic factor.

(iv) Supply fundamental RMS current.

(v) Voltage ripple factor.

Chapter wise Plan

Subject Title: Power Electronics 1

Chapter No. : 4

Chapter Name : Inverters

Approximate Time Needed :10 hrs.

Lesson Schedule :

Lecture No.	Portion covered per hour
31	Introduction, principle of operation, performance parameters of: Single phase half bridge voltage source inverters with R load
32	Introduction, principle of operation, performance parameters of: Single phase half bridge voltage source inverters with R-L load.
33	Introduction, principle of operation, performance parameters of: Single phase full bridge voltage source inverters with R load.
34	Introduction, principle of operation, performance parameters of: Single phase full bridge voltage source inverters with R-L load
35	Three phase bridge inverters (120 Degrees conduction mode) with R load
36	Three phase bridge inverters (120 Degrees conduction mode) with RL load
37	Three phase bridge inverters (180 Degrees conduction mode) with R load
38	Three phase bridge inverters (180 Degrees conduction mode) with RL load
39	Voltage control of single phase inverters using PWM techniques, harmonics
40	Neutralization of inverters.

Objectives:

1. The different types inverters, Single phase half bridge voltage source inverters and full bridge voltage source inverters with detail analysis of each.
2. Study of three phase bridge inverters Comparison based on the performance parameters of each type of inverter.

Lesson Outcomes

1. To gain Knowledge of Difference between signal level and power level semiconductor devices.
2. Basic concepts of power electronics. The important power devices in detail and difference between them.
3. Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.

Model Questions:

Q1 What is an inverter? List a few industrial applications of inverters.

Q2 Draw and explain 1 phase fully controlled inverter is connected to a dc source of Vs .Resolve the output voltage wave shape into Fourier series.

Q3Describe Mc Murray half bridge inverter with appropriate voltage and current waveforms.

Q4 What is an inverter list a few industrial applications of inverters.

Q5 What is pulse width modulation? List the various PWM techniques. How do these differ from each other?

Chapterwise Plan

Subject Title: : Power Electronics1

Chapter No. : 5

Chapter Name : Choppers

Approximate Time Needed : 06 hrs

Lesson Schedule :

Lecture No.	Portion covered per hour
43	Basic principle of step up choppers
44	Basic principle of step down choppers
45	DC-DC switching mode regulators: Buck, Boost regulators concept of rectification. (AC to DC conversion)
46	DC-DC switching mode regulators: Buck-Boost
47	Regulators (CCM mode only The concept of rectification. (AC to DC conversion)
48	Numerical

Objectives:

1. To study the ratings of different power level semiconductor devices, its cooling techniques, and applications based on the same.
2. To study the applications of power semiconductor devices for switching of high power circuits.
3. To study different types of converters, its working and applications.
4. To get an idea about turn on and turn off circuitry for different semiconductor devices.
5. To classify the devices based on their internal structure, turn on and turn off, rating and applications

Outcomes:

The students will

4. To gain Knowledge of Difference between signal level and power level semiconductor devices.
5. Basic concepts of power electronics. The important power devices in detail and difference between them.
6. Ratings of power semiconductor devices in order to design it for specific application, different cooling techniques.

Model Questions:

Q. 1) Discuss the main types of dc choppers. Which of these is more commonly employee and why? Enumerate the application of dc choppers.

Q. 2) Describe the principles of Dc choppers operation. Derive an expression for its average output voltage.

Q3) A 120 V battery supplies RL load through a chopper A freewheeling diode is connected across RL load having R=5ohm and L=60 mH. Load current varies between 7A and 9 A.Calculate time ratios Ton/Toff for this chopper.

Q4) what is the time ratio control in dc choppers? Explain the use the TRC for controlling the output voltage in choppers.

Q5) what is meant by step up chopper? Explain its operation .Sketch the input voltage, input current, output voltage and output current waveforms. State the various assumptions made.

Chapterwise Plan

Subject Title: Power Electronics-1

Chapter No. : 6

Chapter Name : AC Voltage Controllers

Approximate Time Needed: 04 hrs.

Lesson Schedule :

Lecture No.	Portion covered per hour
49	Principle of On-Off control.
50	Principle of phase control.
51	Single phase bidirectional control with R load.
52	Single phase bidirectional control with RL load.

Objectives:

1. To differentiate between signal level semiconductor devices and power level semiconductor devices.
2. To learn the basic concepts of power electronics. Also to study the important powerdevices in detail To get skill of developing and design related to power electronics circuits.
3. To get an idea about turn on and turn off circuitry for different semiconductor devices.
4. To classify the devices based on their internal structure, turn on and turn off, rating and applications.

Lesson Outcomes:

1. To gain Knowledge of Difference between signal level and power level semiconductor devices.
2. Basic concepts of power electronics. The important power devices in detail and difference between them.
3. The use of semiconductor devices to switch on and off high power circuits.
4. Firing circuits (Turn On) and commutation circuits (Turn Off) for different semiconductor devices.
5. Classification of power semiconductor devices based on their rating, internal structure, operation method used for turn on and off of the device.

Model Questions:

Q. 1) what is an AC voltage Converter? List some of its industrial applications. Enumerate its merits and De-merits.

Q. 2) what are the control strategies for the regulation of output voltage in AC voltage Controllers. Discuss the merits and De-merits of the control strategies listed above.

Q. 3) Discuss the principle of the phase control in single-phase full wave AC Voltage controller. Derive expression for the RMS value of its output voltage.

Chapterwise Plan

Subject Title: Power Electronics-I

Chapter No. : 7

Chapter Name : Cycloconvertor

Approximate Time Needed :02 hrs.

Lesson Schedule :

Lecture No.	Portion covered per hour
53	Introduction, single phase Cyclo-converters, applications Principle of On-Off control.
54	Introduction, three phase Cyclo-converters, applications Principle of On-Off control.

OBJECTIVES :

1. To differentiate between signal level semiconductor devices and power level semiconductor devices.
2. To study the ratings of different power level semiconductor devices, its cooling techniques, and applications based on the same.
3. To introduce different types of converters their applications and role of SCR in their operations.

OUTCOME:

1. To gain Knowledge of Difference between signal level and power level semiconductor devices.
2. Basic concepts of power electronics. The important power devices in detail and difference between them.
3. The types of converters viz. DC-DC, DC-AC, AC_AC and applications of these converters to the DC and AC drives.

Model Questions:

Q. 1) what is the Cycloconverter? Enumerate its Industrial Application?

Q. 2) Describe the operating principle of single-phase to single–phase step-up cycloconverter with the help of mid-point and Bridge-type configuration. Illustrate your answer with appropriate circuit diagram and waveforms

Q. 3) Describe the basic principle of working of single-phase to single-phase step-down cycloconverter for both continuous and discontinuous concoctions for a bridge-type cycloconverter. Mark the Conductions for various thyristors also

Assignments

ASSIGNMENT 1 (DATE:9th FEB 2015)

1. Explain the construction and working principle of IGBT with respect to formation of inversion layer and transfer characteristics
2. Write short notes on:
   a. Soft start method
   b. Dynamic characteristics of SCR
   c. Types of cooling of power semiconductors.
3. Differentiate between gate and V-I characteristics of SCR.
4. Explain 3 phase controlled rectifier for resistive load draw output wave form for firing angle alpha at 30 degrees and 60 degrees.
5. Derive the performance factor namely input displacement factor ,input power factor , DC voltage ,Voltage ratio,input current distortion factor ,input harmonic factor and voltage ripple factor for fully controlled single phase rectifier(bridge type) with R-L load.

ASSIGNMENT 2 (DATE: 13thMarch 2015)

1. Describe Mc Murray half bridge inverter with appropriate voltage and current waveforms.
2. What are the control strategies for the regulation of output voltage in AC voltage Controllers?Discuss the merits and De-merits of the control strategies listed above.
3. Describe the principles of Dc choppers operation. Derive an expression for its average output voltage.
4. Describe the basic principle of working of single-phase to single-phase step-down cycloconverter for both continuous and discontinuous concoctions for a bridge-type cycloconverter. Mark the Conductions for various thyristors also

5. What is meant by step up chopper? Explain its operation .Sketch the input voltage, input current, output voltage and output current waveforms. State the various assumptions made.

Con. 3800-11. (REVISED COURSE) RK-2612

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** out of remaining **six** questions.
(3) Assume any **suitable** data wherever **required** but **justify** the same.

1. a. Explain depolarization and re-polarization taking place in human cell. Explain Na-K pump action 20
   b. Explain Einthoven triangle to determine the cardiac output in Bipolar electrode lead system of recording of ECG.
   c. Explain the significance of sa node in case of cardiac cycle
   d. Differentiate between invasive and noninvasive techniques pertaining to Blood Pressure monitoring.
   e. State what you mean by systolic and diastolic in case of Blood pressure measurement.

2. a. Draw neat sketches of different kinds of electrodes used in biomedical instrumentation and explain the use of each type. Why are electrolytes used with electrodes? 10
   b. Explain the working of three op-amps Instrumentation Amplifier. Derive the relationship for gain. Explain the need of signal conditioners in biomedical instrumentation? 10

3. a. Explain all 12-lead configurations in case of Electrocardiograph, with the help of neat diagram show how the measurement is carried out? 10
   b. Differentiate between two electrodes and four electrodes electrical impedance type plethysmograph. Also explain the working. 10

4. a. Explain the working of finger tip oximetry . 10
   b. Explain generation of EEG signal. With neat sketches show different waves generated. Draw the block diagram and explain each block. 10

[TURN OVER

5. a. Explain the working of Ventilator Explain how different parameters are monitored? 10

b. Give basic block diagram of CT scanner. Explain four basic subsystem of computer Tomography. 10

6. a. Draw the block diagram of Electro-surgical unit and explain different modes of operations. 10

b. What is Hemodialysis? Explain the working with neat block diagram. What are the difficulties in carrying on dialysis? 10

7. Write a short note on (any three) : 20

a. Driven –Right leg system in Electrocardiograph.

b. Rate Responsive Pacemaker.

c. Physiology of respiratory system.

d. Telemetry in Bio-physical measurement

e. Electromyography

Con. 4720-12. **GN-9215**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.
(4) Assume **suitable** data, if **any**.

1. Attempt the following :— 20
   (a) Explain briefly, the 'SOA' rating of the Power Transistors.
   (b) Explain the importance of $\frac{dv}{dt}$ and $\frac{di}{dt}$ rating along **with** proper protection circuit in case of SCR.
   (c) State the conditions for getting inversion mode operation in case of line commutated converters.
   (d) Explain the need of commutation in thyristor circuits. What is voltage commutation and current commutation ?

2. (a) Explain with neat circuit diagram and associated waveforms the operation of single phase semiconverter with RL load. Derive the expression for average load voltage, average load current and RMS load voltage. **10**
   (b) Explain with neat diagram the full wave A.C. phase control using Triac and Diac. Draw waveforms. **10**

3. (a) A 3 phase half wave controlled rectifier is operated on a 3 phase A.C. supply with an RMS phase voltage of 230 volts and f = 50 Hz. The load resistance R = 10 Ω. For an average output voltage of 40% of the maximum possible output voltage, Calculate :— **10**
      (i) Delay angle α
      (ii) RMS and average load currents
      (iii) RMS and average thyristor currents.
   (b) Explain UJT triggering circuit for triggering of 2 SCR's used **in full** wave controlled rectifier with proper isolation. What is the need of synchronization circuit ? **10**

4. (a) Explain with neat circuit diagram the operation of static D.C. circuit breaker. **10**
   (b) For a single phase fully controlled bridge rectifier, derive the expression for the following performance factors :— **10**
      (i) D.C. Voltage ratio
      (ii) Current distortion factor
      (iii) Harmonic factor
      (iv) Input displacement factor
      (v) Voltage ripple factor.

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5. (a) Explain the operation of 3 phase fully controlled rectifier with resistive load. Draw the various waveforms for $\alpha = 30°$. **10**
   (b) Explain latchup in IGBT. How does latchup take place and how to avoid it ? **10**

6. (a) Explain with neat diagram and associated waveforms the operation of auxiliary voltage commutation. **10**
   (b) What is half waving effect in case of single phase half wave controlled rectifier with RL load ? **5**
   (c) A half wave controlled rectifier is connected to a 120 V source. Calculate the firing angle necessary to deliver 150 W of power to a 10 Ω load. **5**

7. Write short notes on :— **20**
   (a) Soft start method
   (b) Dynamic (Turn ON and Turn OFF) Characteristics of SCR
   (c) Types of cooling of a power semiconductor device.

VT-S.H.Exam. Oct.-12- 179

Con. 8174-12. KR-9218

(3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is **compulsory**.

(2) Attempt any **four** questions out of remaining **six** questions.

(3) **Figures** to the **right** indicate **full** marks.

1. (a) How protection is offered to an SCR against exessive $\frac{di}{dt}$ and $\frac{dv}{dt}$. 20

(b) Compare BJT, SCR and IGBT.

(c) Explain briefly Need of Electrical Isolation between gate and driver circuit.

(d) Compare natural commutation with forced commutation of SCRs.

2. (a) Explain inverse cosine triggering circuit for SCR. How triggering angle (α) is changed. 10

(b) Explain with the circuit diagram zero voltage switch. 10

3. (a) Explain with neat circuit diagram a single phase full wave half controlled bridge rectifier for a resistive load. Draw a load voltage waveform at $\alpha = 120°$. **10**

(b) Draw and design UJT Triggering circuit. The parameter of the UJT are $V_{BB} = 30V$, $\eta = 0{\cdot}51$, $I_P = 10\ \mu A$, $V_V = 3{\cdot}5V$ and $I_V = 10\ mA$, the frequency of oscillations is f = 60 Hz, and width of the triggering pulse is $t_g = 50\ \mu s$. Assume $V_D = 0{\cdot}5V$ and $C = 0{\cdot}5\ \mu F$. 10

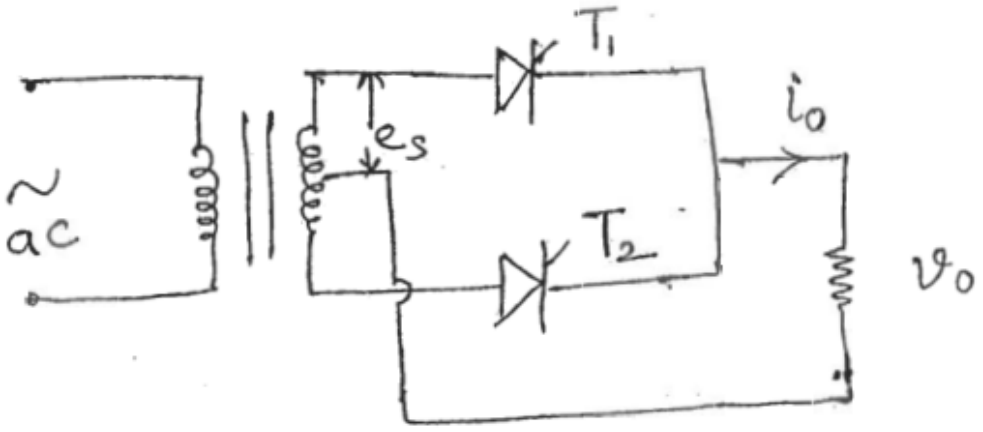
4. (a) Draw and explain 3 ϕ fully controlled rectifier with R load, draw various waveforms when $\alpha = 60°$. 10

(b) Explain full wave ac control using Triac and Diac. Draw waveforms. 10

[TURN OVER

5. (a) The rectifier show in **figure** has a pure resistive load and zero leakage reactance, determine :– 10

   (i) the efficiency
   (ii) the form factor
   (iii) the ripple factor
   (iv) the transformer utilization factor for **firing** angle $\alpha = 0$.



   (b) What is an IGBT ? Sketch the equivalent circuit and transfer characteristics of an IGBT. 10

6. (a) Explain the constructional details and working of an enhancement type power MOSFET. 10

   (b) Explain class C commutation of SCR along with waveforms. 10

7. Write short notes on :– 20

   (a) Soft start circuit
   (b) Effect of free wheeling diode
   (c) Cooling of Semiconductor devices
   (d) External pulse commutation.

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3/6/2013

T.E(ETRX) Sem VI (Rev)

Power Electronics

1st Half-13-Mina - (d)-40

Con. 10073-13. **GS-1357**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions out of **remaining** questions.
(3) Assume **suitable** data wherever **required**.

1. Attempt following questions :— **20**
   (a) What are the minimum requirements to turn on the SCR ?
   (b) Explain two transistor analogy of SCR.
   (c) What are the characteristics of ideal power semi-conductor devices ?
   (d) Explain four-modes of working of TRIAC.
   (e) Compare the power BJT, MOSFET and IGBT.

2. (a) What is the meaning of commutation of SCR ? Explain any two methods in detail. **10**
   (b) Explain the role of UJT as a relaxation oscillator. Draw the appropriate wave forms. **10**

3. (a) Explain the single phase full wave fully controlled rectifier for inductive load. **10**
   (b) Explain the series connection of SCR. What are the problem associated with this connection ? **10**

4. (a) Explain the three phase controlled rectifier for resistive load. Draw the output waveform for firing angle of 30° and 60°. **10**
   (b) What are the protection circuits for SCR ? Explain each circuit in brief. **10**

5. (a) Explain Diac-Triac circuit for regulating the intensity of Light. (Light-dimmer circuit). **10**
   (b) If the half-wave controlled rectifier has a purely load of R and the delay angle is $\alpha = \frac{\pi}{3}$. **10**

   Determine :—
   (i) Rectification efficiency (ii) Form Factor (iii) Ripple Factor.

6. (a) Derive the performance factors namely ; Input Displacement factor, Input Power Factor, DC Voltage, Voltage ratio, Input current distortion factor, Input Harmonic factor and voltage ripple factor for fully-controlled single phase rectifier (Bridge type) with R-L load. **10**
   (b) Explain the construction, working principle, V-I characteristics and applications of DIAC. **10**

7. Write short notes on (any **three**) :— **20**
   (a) Power MOSFET
   (b) IGBT
   (c) GTO SCR
   (d) Cooling methods of SCR.

QP Code : **MV-18248**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Questions **No. 1** is **compulsory**.
(2) Solve **any four** questions out of remaining six questions.
(3) Figures to the right indicate **full marks**.

1. (a) Diffrentiate between gate characteristics and V-I characteristics of SCR. **5**
(b) Justify the use of freewheeling diode in controlled rectitier improves the power factor. **5**
(c) What do you understood by $\frac{di}{dt}$ and $\frac{dv}{dt}$ ratings of SCR. What is the effect on SCR if they are exceeded. **5**
(d) Draw and explain the DC circuit breaker for SCR. **5**

2. (a) What is the difficulty if SCRs connected in series. State and explain different kinds of eqvalising network with their design criterion. **10**
(b) Draw and explain dynamic turn-on and turn-off characteristics of GTO. **10**

3. (a) What do you understand by semiconverter? When it is preferred? Derive the load voltage expression & draw circuit diagram. Explain its working with the help of waveforms. **10**
(b) Draw and explain Ac full wave control circuit using Diac-Triac with the help of waveforms. Derive the expression for RMS load voltage. **10**

4. (a) A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is virtually constant and is equal to I_d. Supply voltage is 230 V and if firing angle is maintained at $\frac{\pi}{6}$. **10**
(i) Average output voltage.
(ii) Supply power factor
(iii) Supply harmonic factor
(iv) Supply fundamental RMS current.
(v) votage ripple factor.
(b) Expalin the construction and working of IGBT with respect to formation of inversion layer and transfer characteristics. **10**

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Con. 13130-14.

5. (a) Draw the protection circuit for SCR against $\frac{dv}{dt}, \frac{di}{dt}$ overvoltage and overcurrent with the help of circuit diagram. **10**

   (b) Draw and explain three phase fully controlled bridge converter with R load for contineous and non-continuous conduction mode. **10**

6. (a) Draw equivalent circuit UJT. Draw V-I characteristics of UJT and explain UJT relaxation oscillator. **10**

   (b) What do you understand by commutation of SCR. Explain class D commotation circuit with the help of waveforms. **10**

7. Write short notes on:

   (i) Operating modes of Triac. **7**

   (ii) Cooling techniques of power devices **6**

   (iii) RC triggering circuit **7**

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