DEPARTMENT OF ECE

Faculty of Engineering and Technology, SRM University

SRM Nagar, Kattankulathur – 603203, Kancheepuram District, Tamilnadu

Test: Cycle Test-II
Course: 15EC303 Digital Signal Processing
Class: V SemB.Tech (ECE)

Date:24-Oct-2017
Duration:3 Hrs
Max. Marks:100

Instructional Objectives

At the end of this course, the students will be able to understand the

SO	a	b	c	d	e	f	g	h	i	j	k
	X	X	X		X						X
Mapping of IO with SO	1	2,4	2		1,2						2

1. Structures of Discrete time signals and systems.
2. Fast Fourier Transform Implementations, Frequency response and design of FIR and IIR filters.
3. Finite word length effect.
4. DSP Processor- TMS320C5X.

Student Outcomes

a) **an ability to apply knowledge of mathematics, science, and engineering**
b) **an ability to design and conduct experiments, as well as to analyze and interpret data**
c) **an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability**
d) an ability to function on multidisciplinary teams
e) **an ability to identify, formulate, and solve engineering problems**
f) an understanding of professional and ethical responsibility
g) an ability to communicate effectively
h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i) a recognition of the need for, and an ability to engage in life-long learning
j) a knowledge of contemporary issues
k) **an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.**

Part B (5*4= 20Marks)
(Answer any FIVE questions)

21. List the advantages and disadvantages of digital filters.

22. Determine the order of the Chebyshev filter for the given specification α_p = 3dB ,α_s = 16dB, δ_p=1 KHz &f_s = 2 KHz

23. Convert the analog filter with system function H(s) into digital filter for T = 0.5 using Bilinear transformation.

$$H(s) = \frac{S+0.3}{(S+0.3)^2 + 16}$$

24. Convert $+0.125_{10}$ and -0.125_{10} to one's complement form of binary by converting the binary to decimal and verify the result by converting the binary to decimal.

25. What is Multirate DSP? List any four applications of Multirate DSP system.

26. Explain the Logical instructions of TMS320C5X processors.

27. Explain the processes involved in speech signal processing with a neat block diagram.

Part C (Answer all) (5*12=60)

28.a.Design a chebyshev IIR low pass filter using Bilinear transformation by taking T=1 sec, to satisfy the following specifications,

$0.8 \le H(e^{j\omega}) \le 1.0$; for $0 \le \omega \le 0.2\pi$

$H(e^{j\omega}) \le 0.2$; for $0.32\pi \le \omega \le \pi$.

(OR)

28.b. Design a Chebyshev IIR low pass filter using Impulse invariant transformation by taking T=1 sec, to satisfy the following specifications,

$0.9 \le H(e^{j\omega}) \le 1.0$; for $0 \le \omega \le 0.25\pi$

$H(e^{j\omega}) \le 0.24$; for $0.5\pi \le \omega \le \pi$.

29.a. Design a Butterworth digital IIR low pass filter using Bilinear transformation by taking T=0.5 sec, to satisfy the following specifications,

$0.707 \le H(e^{j\omega}) \le 1.0$; for $0 \le \omega \le 0.45\pi$

$H(e^{j\omega}) \le 0.2$; for $0.65\pi \le \omega \le \pi$.

(OR)

29.b. Design a Butterworth digital IIR low pass filter using Impulse invariant transformation by taking T=1 sec, to satisfy the following specifications,

$0.9 \leq H(e^{j\omega}) \leq 1.0$; for $0 \leq \omega \leq 0.35\pi$

$H(e^{j\omega}) \leq 0.275$; for $0.7\pi \leq \omega \leq \pi$.

30.a. An LTI system is characterized by the difference equation, $y(n)= 0.75y(n-1)+0.3x(n)$.The input signal x(n) has a range of -4V to +4V,represented by 9 bits. Find the quantization step size, variance of the error signal and the variance of the quantization noise output.

(OR)

30.b.Consider the LTI system governed by the equation , $y(n)+0.8301y(n-1)+0.7348y(n-2) =x(n-2)$.Discuss the effect of coefficient quantization on pole locations,when the coefficients are quantized by,

(i) 3 -bits truncation (ii) 4- bits truncation

31.a. An LTI system is characterized by the difference equation, $y(n) =0.87\ y(n-1) + x(n)$.Determine the limit cycle behavior and the deadband of the system when $x(n) =0$ and $y(-1) = 0.61$Assume that the product is quantized to 4 - bits by rounding.

(OR)

31.b (i) Explain floating point representation of decimal numbers with an example. [

(ii) Consider the discrete time signal shown in the fig.1 Sketch the down sampled version of the signals for the sampling rate reduction factors, (6)

a) D=2 b) D =3

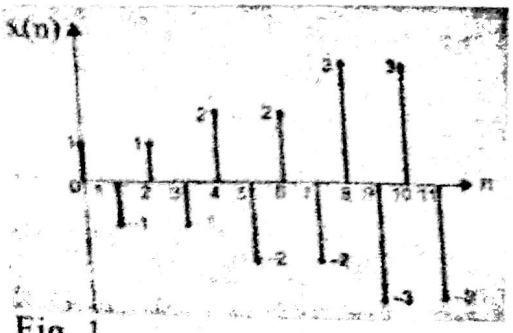

Fig. 1

32.a. Draw the simplified architecture of TMS320C5X processor and explain the various functional units of CPU of TMS320C5X processor.

(OR)

32.b. Explain the addressing modes of TMS320C5X processors with examples.