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DEPARTMENT OF ECE
Faculty of Engineering and Technology, SRM University
 SRM Nagar, Kattankulathur – 603203, Kancheepuram District, Tamilnadu

Test: Cycle Test-I
Course: 15EC303- Digital Signal Processing
Class: V Sem, B.Tech(ECE)
Date: 21-Aug-2017
Duration: 100 minutes
Max. Marks: 50

Mapping of Student Outcomes (SO) with Instructional Objectives (IO) for this course

SO	a	b	c	d	e	f	g	h	i	j	k
		X	X	X	X						X
Mapping of IO with SO	2	3,4	4	1,3,4						1,2	1,2

Instructional Objectives

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 effects in digital filters.
4. DSP processor fundamentals –architecture and addressing modes.

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-A (5 X 4 = 20 Marks)

1. Determine if the following system described by the following input output equation is linear or non linear.
 (i) $y(n) = x^2(n)$
 (ii) $y(n) = nx(n)$
2. How circular convolution is obtained using concentric circle method? Enumerate the steps.
3. Find the IDFT of the sequence
 $X(k) = \{10, -2 + j2, -2, -2 - j2\}$ using DIT algorithm.
4. What are the desirable characteristics of the window used in FIR filter design?
5. Write the equations specifying Hamming and Blackman window.

PART – B (3 x 10 = 30 Marks)

Answer Any Three

6. Compute 8-point DFT of the following sequence
 $x(n) = 1 \quad 0 \leq n \leq 7$
 $0 \quad \text{otherwise}$
 by using DIF algorithm.
7. (i) Find the impulse response of the system described by difference equation $y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ using Z-transform. (6)
 (ii) Calculate the number of multiplications needed in the calculation of DFT and FFT with 64 point sequence. (4)
8. Design an ideal band reject filter with a frequency response
 $H_d(e^{j\omega}) = 1 \text{ for } |\omega| \leq \pi/3 \text{ and } |\omega| \geq 2\pi/3$
 $= 0 \text{ otherwise.}$

Find the value of $h(n)$ for $N = 11$. Find $H(z)$. Plot the magnitude response using rectangular window.

9. Use frequency sampling method to design a FIR low pass filter with $\omega_c = \pi/4$, for $N=15$. Plot the magnitude response.