Reg.No. _____

Karunya UNIVERSITY

(Karunya Institute of Technology & Sciences)
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

End Semester Examination – Nov/Dec – 2016

Code : 14EC2014 **Semester : 2016-17 ODD**
Sub. Name : DIGITAL SIGNAL PROCESSING **Duration : 3hrs**
Max. marks : 100

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	Using the radix-2 DIF FFT algorithm, compute the 8 point DFT of the sequence $x[n]=[1,0,0,0,0,0,0,0]$. Draw the flow graph and show all the intermediate results.	CO1	16
	b.	What are the differences and similarities between DIF and DIT algorithms?	CO1	04
		(OR)		
2.	a.	An 8-point sequence is given by $x[n]=[0,1,2,3,4,5,6,7]$. Compute the 8 point DIT FFT of x (n). Draw the flow graph and tabulate the intermediate stage results.	CO1	20
3.	a.	Find $y(n)=x(n)*h(n)$ for the sequences $x(n)=[1,2,1,2,1,2,1,2,1,2]$ and $h[n]=[1,2,1]$ using overlap save method.	CO1	16
	b.	Determine the DFT of the sequence $x[n]=[-1,1,-1,1]$ for N=4.	CO1	04
		(OR)		
4.	a.	Perform overlap add convolution for the given two input sequences $h[n]=[1,2,1]$ and $x[n]=[1,2,-1,2,3,-2,-3,-1,1,1,2,-1]$. Also verify your result with linear convolution method.	CO1	20
5.	a.	Design a digital Butterworth filter that satisfies the following constraints using bilinear transformation. Assume T=1 s. $$0.707 \le \left\|H(e^{jw})\right\| \le 1 ; 0 \le w \le \frac{\pi}{2}$$ $$\left\|H(e^{jw})\right\| \le 0.2 ; \frac{3\pi}{4} \le w \le \pi$$	CO2	16
	b.	Using impulse invariance method convert the following analog transfer function into digital with sampling period T= 0.2 second. $$H(s)=\frac{1}{(s+1)(s+2)}$$	CO2	04

(OR)

6. a. Design a Chebyshev filter for the following specifications using impulse invariance method. CO2 20

$$0.8 \le \left|H(e^{j\omega})\right| \le 1 \qquad for \quad 0 \le \omega \le 0.2\pi$$
$$\left|H(e^{j\omega})\right| \le 0.2 \qquad for \quad 0.6\pi \le \omega \le \pi$$

7. a. Design a linear phase FIR digital filter for the given specifications using Hanning window of length M=7. CO2 16

$$H_d(\omega) = \begin{cases} e^{-j3\omega} & for \ |\omega| \le \pi/4 \\ 0 & for \ \pi/4 < |\omega| \le \pi \end{cases}$$

b. Obtain linear phase structure with minimum number of multipliers for the system described by the equation. CO2 04

$$y(n) = x(n) + \left(\frac{1}{2}\right)x(n-1) - \left(\frac{1}{4}\right)x(n-2) + \left(\frac{1}{2}\right)x(n-3) + x(n-4)$$

(OR)

8. a. Design and implement a linear phase FIR filter of length N=15 by frequency sampling method which has the following unit sample sequence. CO2 20

$$H\left(\frac{2\pi K}{15}\right) = \begin{cases} 1 & \text{for } K = 0, 1, 2, 3 \\ 0 & \text{for } K = 4, 5, 6, 7. \end{cases}$$

Compulsory:

9. a. Illustrate zero-input limit cycle oscillations with an example. CO3 12

b. With neat block diagram explain the Harvard architecture. CO3 04

c. Explain coefficient quantization effects in direct form realization of IIR filter. CO3 04

ALL THE BEST

Course outcome

CO 1: The students gain basic knowledge about digital signal processing.

CO 2: The students understand Digital (IIR and FIR) filter design procedures.

CO 3: The students acquire knowledge on finite word length effects and PDSPs.