Reg.No. ____________

Karunya UNIVERSITY

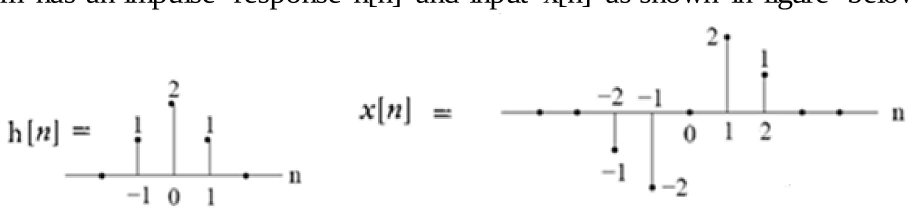
(Karunya Institute of Technology & Sciences)

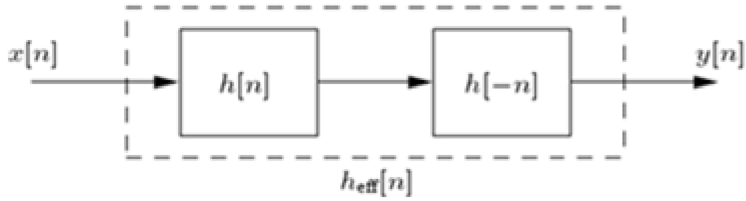
(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

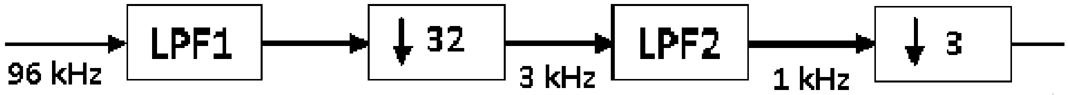
End Semester Examination – Nov/Dec – 2016

		Semester :	**2016-17 ODD**
Code :	**14EC3072**	**Duration :**	**3hrs**
Sub. Name :	**Advanced Digital Signal Processing**	**Max. marks :**	**100**

ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)

Q. No.	Sub Div.	Questions	Course Outcome	Marks
1.	a.	From each of the following input/output relationships, determine whether thecorresponding system is linear/non-linear, time in-variant/time variant, causal/non causal. $y(t) = t^2 x(t-1)$ $y[n] = x[n+1] - x[n-1]$ $y[n] = x^2[n-2]$	CO1	**10**
	b.	Let g[n] and h[n] be even and odd real sequences. Determine if x[n] = g[n]h[n] is even or odd.	CO1	**5**
	c.	Compare digital signal processing with analog signal processing highlighting the advantages and disadvantages	CO1	**5**
(OR)				
2.	a.	Evaluate $y[n] = x[n] * h[n]$ $x[n] = \delta[n] - 2\delta[n-1] + \delta[n-2]$, $h[n] = u[n] - u[n-3]$	CO1	**10**
	b.	Check whether the following signals are energy signal or not. i) $x(t) = e^{-3t} u(t)$ ii) $x(n) = \left(\frac{1}{3}\right)^n u(n)$	CO1	**6**
	c.	Determine whether $x[n] = 5 \sin[6\pi n/35]$ is periodic, and if it is, find the fundamental period.	CO1	**4**
3.	a.	The following signals are defined on the interval n = 0, 1, 2, 3: $x_1[n] = (1/2)^n$ and $x_2[n] = (-1)^n$. Compute the 4 point circular convolution $y[n] = x_1[n] \Theta x_2[n]$	CO1	**10**
	b.	Consider two systems described by the following linear constant coefficient difference equations: $y[n] = 0.2y[n-1] + x[n] - 0.3x[n-1] + 0.02x[n-2]$ $y[n] = x[n] - 0.1x[n-1]$. Prove that the two systems are equivalent.	CO1	**10**
(OR)				
4.	a.	A system has an impulse response h[n] and input x[n] as shown in figure below.  Determine the response of the system. Is the system causal? Why?	CO1	**10**

	b.	a. Prove the following properties of convolution operation i) x[n]* h[n] = h[n]*x[n] (4) ii) x[n]*{h_1[n] + h_2[n]} = x[n]* h_1[n] + x[n]* h_2[n] (4) iii) {x[n] * h_1[n]} * h_2[n] = x[n]* {h_1[n] * h_2[n]} (6)	CO1	**10**
5.	a.	Consider the system below  where $h[n] = \delta[n] - 2\delta[n-1] - \delta[n-2]$. (i) Find the DFT H_{eff}[k] linking the input x and the output y[n]. (ii) Find h_{eff}[n] using IDFT.	CO2	**10**
	b.	Determine the inverse Z transform of X(z) = $\frac{z+2}{2Z^2-7z+3}$ by partial fraction expansion method if the ROC s are a) |z|>3 b) |z|< 1/2 c) ½ <|z|< 3	CO2	**10**
		(OR)		
6.	a.	Determine the 8 point DFT of the real valued sequence x[n] = δ [n-3].	CO2	**10**
	b.	Determine the transfer function and impulse response for the causal LTI system described by the difference equation y[n] - (1/4)y[n-1] - (3/8)y[n-2] = -x[n] + 2x[n-1]	CO2	**6**
	c.	Prove that IDFT can be calculated using DFT algorithm	CO2	**4**
7.	a.	Design a linear phase High Pass FIR Filter with a cut-off frequency of 0.5π radians/sample using a finite rectangular window of length 9 samples.	CO3	**10**
	b.	Derive the expression of bilinear transformation and hence deduce the relationship between analog frequency Ω and the digital frequencyω. Also explain the concept of frequency warping.	CO3	**10**
		(OR)		
8.	a.	Obtain the direct form I, direct form II and Cascade realization of the LTI system $H(z) = \frac{1+3z^{-1}+2z^{-2}}{1+0.375z^{-1}-0.09z^{-2}-0.015z^{-3}}$	CO3	**10**
	b.	Write the steps to design an FIR filter using frequency sampling technique.	CO3	**4**
	c.	For the analog transfer function H(s) = $\frac{(s+1)}{(s+2)(s+5)}$, determine H(z) using bilinear transformation. Assume T= 1 sec.	CO3	**6**
		<u>Compulsory:</u>		
9.	a.	Explain with block diagram the implementation of Audio-Sub band Coding and Decoding system.	CO3	**10**
	b.	The sampling rate of a signal x[n] is to be reduced, by decimation, from 96 kHz to 1 kHz. The highest frequency of interest after decimation is 450 Hz. Design the specification of filters LPF1 and LPF2 for a two stage decimation as shown in fig. below with an overall pass band ripple of δp = 0.01 and stop band deviation δs = 0.001.	CO3	**10**



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