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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Sixth Semester

Electrical and Electronics Engineering

EC 1361 - DIGITAL SIGNAL PROCESSING

(Common to Instrumentation and Control Engineering and Flex*ronics and Instrumentation Engineering)

(Regulation 2004)

Time: Three hours

Maximum: 100 marks

Answer ALL questions.

PART A —
$$(10 \times 2 = 20 \text{ m. cks})$$

- What is the total energy of the discrete transignal x(n) which takes the value of unity at n = -1, 0, 1?
- 2. Draw the signal x(n) = u(n) u(n-3).
- Mention the basic factors that at let the ROC of Z transformation.
- 4. Find the Z-transform of (a) a Sigital impulse (b) a digital step.
- What is FFT?
- How many multiplications and additions are required to compute N point DFT using radix-2 FI^{nt};
- 7. Give the ϵ vision for the order of N and cutoff frequency Ω_c of the Butterwooth liter.
- What we he design techniques of designing FIR filters?
- 9. What's pipelining in a digital signal processor?
- 10. Mention the four different buses of TMS320C5x and their functions.

			PART B (5 × 16 = 80 marks)	
11.	(a)		ermine whether or not each of the following signals is periodic. al is periodic specify its fundamental time period.	If a
		(i)	$x(t) = 2\cos(3\pi t)$	
		(ii)	$x(t) = \sin(15\pi t) + \sin(20\pi t)$	
		(iii)	$x(n) = 5\sin(2n)$	
	+11.7	(iv)	$x(n) = \cos\left(\frac{n}{8}\right)\cos\left(\frac{\pi n}{8}\right).$	* **
			Or	
	(b)	(ii) l	ermine whether the following system is (i) tat: or dyn- linear or nonlinear (iii) shift invariant or not (i) exusal or nones stable or unstable.	
		y(n)	$=x(n)\cos(\alpha_0 n)$.	
		<i>(</i> 1)	Attailed of Analoso	(0)
12.	(a)	(i)	State and prove convolution theorem > 2 transform.	(8)
		(ii)	Given $x(n) = \delta(n) + 2\delta(n-1)$ and $y(n) = 3\delta(n-1) + \delta(n) - \delta(n-1)$	-1),
			find $x(n) * y(n)$ and $X(Z) \cdot Y(Y)$.	(8)
			Cr	
	(b)	Fine	I the Z-transform of	
		(i)	$\cos \omega_0 n \cdot \omega(n) = x_1(n)$	
		(ii)	$\sin a_0 n \cdot u(n) = \lambda_2 \cdot \cdots$	(16)
13.	(a)	(i)	Determine the 8 point DFT of the sequence	3
			$x(n) = \{0,, 1, 1, 1, 0, 0, 0\}.$	(8)
		(ii)	Find the Circular convolution of $x_1(n) = \{1, 2, 3, 4\}$ $x_2, a_n^{(n)} = \{4, 3, 2, 1\}.$	and (8)

(b) Pearmine the 8 point DFT of the signal $x(n) = \{1, 1, 1, 1, 1, 1, 0, 0\}$ and s. Ach its magnitude and phase.

 (a) Obtain the direct form I, direct form II, cascade and parallel form realization for the system

$$y(n) = -0.1 \, y(n-1) + 0.2 \, y(n-2) + 3 \, x(n) + 3.6 \, x(n-1) + 0.6 \, x(n-2) \, .$$

Or

(b) Design an ideal Hilbert transformer having frequency response

$$H(e^{j\omega}) = j;$$
 for $-\pi \le \omega \le 0$
= $-j;$ for $0 \le \omega \le \pi$.

Using (i) Rectangular window (ii) Blackman window for N = 11.

15. (a) (i) Find the effect of co-efficient quantization on the pole acations of the second order IIR system given by

$$H(Z) = \frac{1.0}{(1 - 0.5 \, Z^{-1})(1 - 0.45 \, Z^{-1})}$$

when it is realized in Direct form-I and ir. Cascade form. Assume a word length of 3 bits. (8)

(ii) Explain the characteristics of a limit cycle oscillation with respect to the system described by the difference equation $y(n) = 0.95 \ y(n-1) + x(n)$. Determ, a the dead band of the filter. (8)

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(b) Give a detailed note on Direct Me ray Access Controller in TMS320C54x processor. (16)