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Total Number of Pages: 02

B.Tech
PCBM4302

5th Semester Back Examination 2017-18

SIGNALS AND SYSTEMS

BRANCH: AEIE, BIOMED, BIOTECH, CSE, ECE, EIE, ETC, IT, ITE

Time: 3 Hours

Max Marks: 70

Q.CODE: B205

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.

Q1 Answer the following questions: **(2 x 10)**

- a) Folding and shifting operations are not commutative. Justify.
- b) Define twiddle factor.
- c) Compute DFT of 1.
- d) State two properties of Fourier transform.
- e) Evaluate the following integral. $\int_{-\infty}^{\infty} \delta(1-t)(t^3+1) dt$
- f) If $X(\omega)$ is the Fourier transform of $x(t)$, what is the Fourier transform of $2x\left(\frac{t}{2}-5\right)$?
- g) Describe the homogeneity property of continuous system.
- h) State multiplication property in Z domain.
- i) What is BIBO stability? Write the condition for LTI system.
- j) Write complex conjugate property of DFT.

Q2 a) A discrete time signal is defined as **(5)**

$$x(n) = \begin{cases} 1 + \frac{n}{3}, & -3 \leq n \leq -1 \\ 1, & 0 \leq n \leq 3 \\ 0, & \text{Elsewhere} \end{cases}$$

- a. Determine its value and sketch the signal.
- b. Sketch the signal if the signal is delayed by four samples and then folded.
- c. Sketch the signal $x(-n+4)$.

b) Explain with suitable example the realization of LTI system by direct form 1 and direct form 2. **(5)**

Q3 a) What is normalized cross correlation and what is its benefit? **(5)**

b) Determine the Fourier transform of a gate pulse, of unit height, unit width and centered at $t=0$. Also draw its spectra. **(5)**

Q4 a) Find the Fourier transform of a double-sided exponential signal $e^{-b|t|}$ and draw the spectrum. **(5)**

b) Prove the convolution and correlation properties of Z transform. **(5)**

- Q5 a)** Consider the sequence $x(n) = a^n u(n)$, $-1 < a < 1$. Determine at least two sequences that are not equal to $x(n)$ but have the same auto correlation. **(5)**
- b)** State and prove circular time and circular frequency shift property of DFT. **(5)**

- Q6 a)** Determine the stability region for the casual system **(5)**

$$H(Z) = \frac{1}{1 + a_1 z^{-1} + a_2 z^{-2}}$$

by computing its poles and restricting them to be inside the unit circle.

- b)** If $x(n)$ is real and odd then prove that DFT $X(k)$ is purely imaginary and odd. **(5)**

- Q7** Find the Fourier transform of $Sgn(t)$ and represent its spectrum. **(5)**

Determine the response $y(n)$, $n \geq 0$ of the system described by the difference equation **(5)**

$$y(n] = 4y(n-1) + 4y(n-2) = x(n) - x(n-1)$$

- Q8 Write short answer on any TWO: (5 x 2)**

- a)** Energy and power signal.
b) Casual and noncasual signal.
c) Stability of linear time-invariant signal.
d) Region of convergence