Thapar University, Patiala

Electronics and Communication Engineering Department

Mid Semester Test
Max. Marks: 25
Date: March 23, 2017
Instructor: Dr. Kulbir Singh

UEC 404 (Signals and Systems)
Time Allotted: 2 Hrs.
B.E. 2nd year Mechatronics (MTX)

Instructions: You are expected to answer all (Five) questions. Organize your work, in a reasonably neat and coherent way. Mysterious or unsupported answers will not receive full credit. Calculator without graphing mode and alphanumeric memory is permitted. Assume any missing data/information, appropriately.

Q1.	a)	Differentiate analog and discrete time domain signals.	1
	b)	Test the following systems for Linearity: i) $y(t) = A\,x(t) + B$ ii) $y(n) = n\,x^2(n)$	2
	c)	Test the following systems for Time invariance: i) $y(t) = x(t)\,sin20\pi t$ ii) $y(n) = x(n) - b\,x(n-1)$	2
Q2.		Perform the Linear and Circular convolution of the sequences: $x_1(n) = \{2,1,2,1\}$ and $x_2(n) = \{1,2,3,4\}$. Also Calculate Linear convolution using Circular convolution.	5
Q3.		Determine the Fourier Series representation of the following discrete/continuous time domain signals: i) $x(n) = 4\,cos\frac{\pi n}{2}$ ii) $x(t) = \begin{cases} A & for\ t = 0\ to\ \frac{T}{2} \\ -A & for\ t = \frac{T}{2}\ to\ T \end{cases}$	2.5, 2.5
Q4.		Calculate the Fourier transform of the following discrete/continuous time domain signals: i) $x(t) = A\,cos\Omega_0 t$ ii) $x(n) = \frac{1}{2}\left[\left(\frac{1}{2}\right)^n + \left(\frac{1}{4}\right)^n\right]u(n)$	2.5, 2.5
Q5.	a)	State and prove the Sampling theorem with suitable example.	2
	b)	Let an analog signal, $x_a(t) = 10\,cos100\pi t + 5\,cos150\pi t$. If the sampling frequency is 75 Hz, find the discrete time signal x(n). Also find an alias frequency corresponding to $F_s = 75Hz$.	2
	c)	What is the relationship between Laplace and Fourier Transform?	1