2015
B.E. (Electrical and Electronics Engineering)
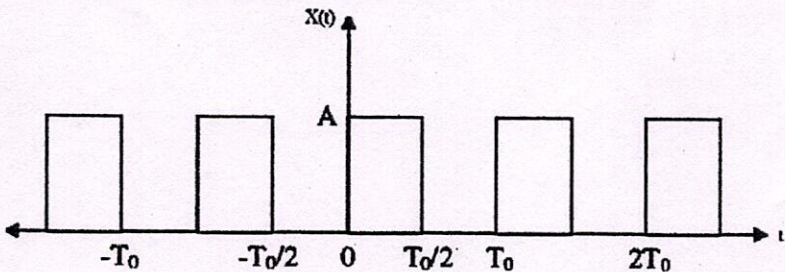### Sixth Semester
PC-EE-604: Signals and Systems

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting two questions from each Section.

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Q.1a)	Sketch the waveform of following signal: $x(t) = u(t) - u(t-3)$.	(5×2)
b)	State the Dirichlet's conditions for the Fourier transform to exist?	
c)	Relate the impulse signal, step signal, ramp signal.	
d)	Find the Nyquist rate for the signal $x(t) = 1+\cos 10\,\pi t$, in Hz.	
e)	Check whether the given system is time invariant and linear. $y(t) = x(t^2) + x(t)$	
Section A		
Q.2a)	Check whether the given system is linear or non-linear: $y(t) = \sin(x(t+2))$	(6)
b)	A Discrete Time system is described by the difference equation. $y[n] +0.1\,y[n-1]- 0.2\,y[n-2] = x[n]+x[n-1]$. Find the impulse response of the system.	(4)
Q.3a)	Compute the Fourier transform of the signal, $x(t)=e^{-t}u(t)$.	(4)
b)	State and prove the following properties of continuous time Fourier transform: Scaling, Convolution.	(3)
c)	What is a Dirac delta function? Enlist its properties.	(3)
Q.4	Consider the periodic square wave $x(t)$ as shown in figure 1 given below. Determine the complex exponential Fourier series of $x(t)$ Figure 1	(10)
Section B		
Q.5a)	State and prove the duality property of DFT.	(4)
b)	What kind of filter is an ideal Hilbert transformer? Discuss. How much phase shift does Hilbert transformer impart on the input?	(6)
Q.6	Given that $x(n)$ has Fourier transform $X(e^{jw})$, express the Fourier transform of the following signals in terms of $X(e^{jw})$: $y(n) = x(1-n) + x(-1-n)$	(10)
Q.7a)	When does aliasing occur? What is anti-aliasing filter?	(5)
b)	State and prove sampling theorem for Band limited Signals. What is the Nyquist sampling rate?	(5)

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