Philadelphia University
Faculty of Engineering

Marking Scheme

Examination Paper

BSc CEE

Signals and Systems *(*650320+640543*)*

Third Quiz First semester Date: 14/01/2020

Section 1

Weighting 5% of the module total

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Marking Scheme

Signals and Systems *(650320)*

The presented quiz questions are organized to overcome course material through 1 question.

The *all questions* are compulsory requested to be answered.

Marking Assignments

Question 1: This question is attributed with 5 marks if answered properly,

Solution

Property	Aperiodic Signal	Fourier transform
	$x(t)$ $y(t)$	$X(j\omega)$ $Y(j\omega)$
Linearity	$ax(t)+by(t)$	$aX(j\omega)+bY(j\omega)$
Time-shifting	$x(t-t_0)$	$e^{-j\omega t_0}X(j\omega)$
Frequency-shifting	$e^{j\omega_0 t}x(t)$	$X(j(\omega-\omega_0))$
Conjugation	$x^*(t)$	$X^*(-j\omega)$
Time-Reversal	$x(-t)$	$X(-j\omega)$
Time- and Frequency-Scaling	$x(at)$	$\frac{1}{\lvert a\rvert}X\left(\frac{j\omega}{a}\right)$
Convolution	$x(t)*y(t)$	$X(j\omega)Y(j\omega)$
Multiplication	$x(t)y(t)$	$\frac{1}{2\pi}X(j\omega)*Y(j\omega)$
Differentiation in Time	$\frac{d}{dt}x(t)$	$j\omega X(j\omega)$
Integration	$\int_{-\infty}^{t}x(t)dt$	$\frac{1}{j\omega}X(j\omega)+\pi X(0)\delta(\omega)$
Differentiation in Frequency	$tx(t)$	$j\frac{d}{d\omega}X(j\omega)$
Conjugate Symmetry for Real Signals	$x(t)$ real	$\begin{cases}X(j\omega)=X^*(-j\omega)\\ \Re e\{X(j\omega)\}=\Re e\{X(-j\omega)\}\\ \Im m\{X(j\omega)\}=-\Im m\{X(-j\omega)\}\\ \lvert X(j\omega)\rvert=\lvert X(-j\omega)\rvert\\ \measuredangle X(j\omega)=-\measuredangle X(-j\omega)\end{cases}$
Symmetry for Real and Even Signals	$x(t)$ real and even	$X(j\omega)$ real and even
Symmetry for Real and Odd Signals	$x(t)$ real and odd	$X(j\omega)$ purely imaginary and odd
Even-Odd Decomposition for Real Signals	$x_e(t)=\mathcal{E}v\{x(t)\}$ $[x(t)$ real$]$ $x_o(t)=\mathcal{O}d\{x(t)\}$ $[x(t)$ real$]$	$\Re e\{X(j\omega)\}$ $j\Im m\{X(j\omega)\}$

Parseval's Relation for Aperiodic Signals

$$\int_{-\infty}^{+\infty}|x(t)|^2dt=\frac{1}{2\pi}\int_{-\infty}^{+\infty}|X(j\omega)|^2d\omega$$