Electronics And Instrumentation

4th Semester

Subject: Signal & Systems
Subject code: BT 403

Practice Set-1

P1.1

Evaluate each of the following expressions for the complex number $z = \frac{1}{2}e^{j\pi/4}$.

(a) $Re\{z\}$

(b) $Im\{z\}$

(c) $|z|$

(d) $\sphericalangle z$

(e) z^* (* denotes complex conjugation)

(f) $z + z^*$

P1.2

Let z be an arbitrary complex number.

(a) Show that

$$Re\{z\} = \frac{z + z^*}{2}$$

(b) Show that

$$jIm\{z\} = \frac{z - z^*}{2}$$

P1.3

Using Euler's formula, $e^{j\theta} = \cos\theta + j\sin\theta$, derive the following relations:

(a) $\cos\theta = \dfrac{e^{j\theta} + e^{-j\theta}}{2}$

(b) $\sin\theta = \dfrac{e^{j\theta} - e^{-j\theta}}{2j}$

P1.4

(a) Let $z = re^{j\theta}$. Express in polar form (i.e., determine the magnitude and angle for) the following functions of z:

(i) z^*

(ii) z^2

(iii) jz

(iv) zz^*

(v) $\dfrac{z}{z^*}$

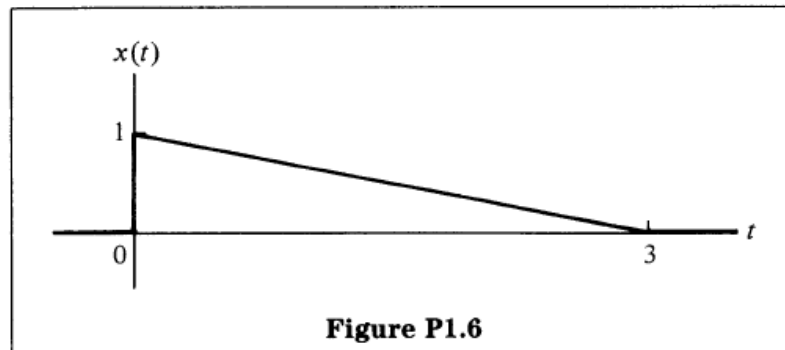(vi) $\dfrac{1}{z}$

P1.5 _____

Show that

$$(1 - e^{j\alpha}) = 2 \sin\left(\frac{\alpha}{2}\right) e^{j[(\alpha-\pi)/2]}$$

P1.6 _____

For $x(t)$ indicated in Figure P1.6, sketch the following:

(a) $x(-t)$

(b) $x(t + 2)$

(c) $x(2t + 2)$

(d) $x(1 - 3t)$

Figure P1.6

P1.7 _____

Evaluate the following definite integrals:

(a) $\displaystyle\int_0^a e^{-2t}\, dt$

(b) $\displaystyle\int_2^\infty e^{-3t}\, dt$