Ex 1: Using Phasors to Add Sinusoids

Tuesday, 4 August, 2020 11:54 AM

Suppose that,

$v1(t) = 20\cos(\omega t - 45^\circ)$

$v2(t) = 10\sin(\omega t + 60^\circ)$

Reduce the sum $vs(t) = v1(t) + v2(t)$ to a single term.

$Vs(t) = 20\cos(\omega t - 45^\circ) + 10\sin(\omega t + 60^\circ)$

Step 1: Convert to cosine form

$Vs(t) = 20\cos(\omega t - 45^\circ) + 10\cos(\omega t + 60^\circ - 90)$
$Vs(t) = 20\cos(\omega t - 45^\circ) + 10\cos(\omega t - 30)$

Step 2: Represent in Phasor Form
$Vs(t) = 20\angle -45 + 10\angle -30$

Step 3: Convert Phasor to Complex
Vs(t) = 20(cos(-45)+j sin(-45)) + 10(cos(-30)+j sin(-30))

Vs(t)=20(0.7071 + j (-0.7071)) + 10 (0.86+j(-0.5))

Vs(t) = 22.8 - j 19.14

Step 4: Complex to Phasor form
$Vs(t) = \text{sqrt}(22.8^2 + (-19.14^2))\angle \tan^{\uparrow}\left(-\frac{19.14}{22.8}\right)$

Vs(t) = 29.7∠-40

Step 5: Representing in Sinusoidal Voltage

$$v_s(t) = 29.7 \cos(\omega t - 40^\circ)$$

Ex 2: Reduce the following expressions by using phasors

Tuesday, 4 August, 2020 12:14 PM

v1(t) = 10 cos(ωt) + 10 sin(ωt)

Step 1: 10 cos(ωt) + 10 cos(ωt-90)

Step 2: 10∠0 + 10∠-90

Step 3: 10(cos(0)+j sin(0)) + 10 (cos(-90)+j sin(-90))

v1(t) =10(1+j 0) + 10 (0 + j(-1))

V1(t) = 10-10j

Step 4:

V1(t) = sqrt(10^2+10^2)∠$\tan^{\uparrow}(-\frac{10}{10})$

V1(t) = 14.14∠-45

Step 5: 14.14cos(ωt-45)

Ex 2.2

Tuesday, 4 August, 2020 12:14 PM

$$i1(t) = 10\cos(\omega t + 30^\circ) + 5\sin(\omega t + 30^\circ)$$

Ex 2.3

Tuesday, 4 August, 2020 12:14 PM

$$i2(t) = 20\sin(\omega t + 90^\circ) + 15\cos(\omega t - 60^\circ)$$