

Solution of ECE 315 Test 7 F06

Find the numerical values of the constants.

1. $10 \sin(32\pi t) \xleftrightarrow{\text{FS}} A\delta[k-a] + B\delta[k-b]$, $T_F = 1/16$

Using $\sin(2\pi f_0 t) \xleftrightarrow{\text{FS}} (j/2)(\delta[k+m] - \delta[k-m])$, $T_F = mT_0$

$\sin(32\pi t) \xleftrightarrow{\text{FS}} (j/2)(\delta[k+1] - \delta[k-1])$, $T_F = T_0 = 1/16$

$10 \sin(32\pi t) \xleftrightarrow{\text{FS}} j5(\delta[k+1] - \delta[k-1])$, $T_F = T_0 = 1/16$

$10 \sin(32\pi t) \xleftrightarrow{\text{FS}} j5\delta[k-(-1)] + (-j5)\delta[k-1]$, $T_F = T_0 = 1/16$

$A = j5$, $a = -1$, $B = -j5$, $b = 1$

2. $3 \cos(44\pi t) \xleftrightarrow{\text{FS}} A\delta[k-a] + B\delta[k-b]$, $T_F = 1/11$

Using $\cos(2\pi f_0 t) \xleftrightarrow{\text{FS}} (1/2)(\delta[k-m] + \delta[k+m])$, $T_F = mT_0$

$\cos(44\pi t) \xleftrightarrow{\text{FS}} (1/2)(\delta[k-2] + \delta[k+2])$, $T_F = 2T_0 = 1/11$

$3 \cos(44\pi t) \xleftrightarrow{\text{FS}} (3/2)(\delta[k-2] + \delta[k+2])$, $T_F = 2T_0 = 1/11$

$3 \cos(44\pi t) \xleftrightarrow{\text{FS}} ((3/2)\delta[k-2] + (3/2)\delta[k-(-2)])$, $T_F = 2T_0 = 1/11$

$A = 3/2$, $a = 2$, $B = 3/2$, $b = -2$

3. $A \text{rect}(at) * \text{comb}(bt) \xleftrightarrow{\text{FS}} 30 \text{sinc}(2k)$, $T_F = T_0 = 2$

Using $(1/w)\text{rect}(t/w) * f_0 \text{comb}(f_0 t) \xleftrightarrow{\text{FS}} f_0 \text{sinc}(wkf_0)$, $T_F = T_0$

$(1/4)\text{rect}(t/4) * (1/2)\text{comb}(t/2) \xleftrightarrow{\text{FS}} (1/2)\text{sinc}(2k)$, $T_F = T_0 = 2$

$(15/2)\text{rect}(t/4) * \text{comb}(t/2) \xleftrightarrow{\text{FS}} 30 \text{sinc}(2k)$, $T_F = T_0 = 2$

$A = 15/2$, $a = 1/4$, $b = 1/2$

4. $\frac{d}{dt}(2 \text{rect}(4t) * \text{comb}(t)) \xleftrightarrow{\text{FS}} A k \text{sinc}(ak)$, $T_F = 1$

$A = \underline{\hspace{2cm}}$, $a = \underline{\hspace{2cm}}$

Using $(1/w)\text{rect}(t/w) * f_0 \text{comb}(f_0 t) \xleftrightarrow{\text{FS}} f_0 \text{sinc}(wkf_0)$, $T_F = T_0$

$4 \text{rect}(4t) * \text{comb}(t) \xleftrightarrow{\text{FS}} \text{sinc}(k/4)$, $T_F = T_0 = 1$

$2 \text{rect}(4t) * \text{comb}(t) \xleftrightarrow{\text{FS}} (1/2)\text{sinc}(k/4)$, $T_F = T_0 = 1$

$\frac{d}{dt}(2 \text{rect}(4t) * \text{comb}(t)) \xleftrightarrow{\text{FS}} j2\pi k (1)(1/2)\text{sinc}(k/4)$, $T_F = T_0 = 1$

$\frac{d}{dt}(2 \text{rect}(4t) * \text{comb}(t)) \xleftrightarrow{\text{FS}} j\pi k \text{sinc}(k/4)$, $T_F = T_0 = 1$

$A = j\pi = j3.14$, $a = 1/4$

Solution of ECE 315 Test 7 F06

Find the numerical values of the constants.

1. $4 \sin(36\pi t) \xrightarrow{\text{FS}} A\delta[k-a] + B\delta[k-b]$, $T_F = 1/18$
 Using $\sin(2\pi f_0 t) \xrightarrow{\text{FS}} (j/2)(\delta[k+m] - \delta[k-m])$, $T_F = mT_0$
 $\sin(36\pi t) \xrightarrow{\text{FS}} (j/2)(\delta[k+1] - \delta[k-1])$, $T_F = T_0 = 1/18$
 $4 \sin(32\pi t) \xrightarrow{\text{FS}} j2(\delta[k+1] - \delta[k-1])$, $T_F = T_0 = 1/18$
 $4 \sin(32\pi t) \xrightarrow{\text{FS}} j2\delta[k - (-1)] + (-j2)\delta[k-1]$, $T_F = T_0 = 1/18$
 $A = j2$, $a = -1$, $B = -j2$, $b = 1$

2. $8 \cos(64\pi t) \xrightarrow{\text{FS}} A\delta[k-a] + B\delta[k-b]$, $T_F = 1/8$
 Using $\cos(2\pi f_0 t) \xrightarrow{\text{FS}} (1/2)(\delta[k-m] + \delta[k+m])$, $T_F = mT_0$
 $\cos(64\pi t) \xrightarrow{\text{FS}} (1/2)(\delta[k-4] + \delta[k+4])$, $T_F = 4T_0 = 1/8$
 $8 \cos(64\pi t) \xrightarrow{\text{FS}} 4(\delta[k-4] + \delta[k+4])$, $T_F = 4T_0 = 1/8$
 $8 \cos(64\pi t) \xrightarrow{\text{FS}} (4\delta[k-4] + 4\delta[k - (-4)])$, $T_F = 4T_0 = 1/8$
 $A = 4$, $a = 4$, $B = 4$, $b = -4$

3. $A \text{rect}(at) * \text{comb}(bt) \xrightarrow{\text{FS}} 18 \text{sinc}(6k)$, $T_F = T_0 = 4$
 Using $(1/w)\text{rect}(t/w) * f_0 \text{comb}(f_0 t) \xrightarrow{\text{FS}} f_0 \text{sinc}(w k f_0)$, $T_F = T_0$
 $(1/24)\text{rect}(t/24) * (1/4)\text{comb}(t/4) \xrightarrow{\text{FS}} (1/4)\text{sinc}(6k)$, $T_F = T_0 = 4$
 $(3/4)\text{rect}(t/24) * \text{comb}(t/4) \xrightarrow{\text{FS}} 18 \text{sinc}(6k)$, $T_F = T_0 = 4$
 $A = 3/4$, $a = 1/24$, $b = 1/4$

4. $\frac{d}{dt}(9 \text{rect}(5t) * \text{comb}(t)) \xrightarrow{\text{FS}} Ak \text{sinc}(ak)$, $T_F = 1$
 Using $(1/w)\text{rect}(t/w) * f_0 \text{comb}(f_0 t) \xrightarrow{\text{FS}} f_0 \text{sinc}(w k f_0)$, $T_F = T_0$
 $5 \text{rect}(5t) * \text{comb}(t) \xrightarrow{\text{FS}} \text{sinc}(k/5)$, $T_F = T_0 = 1$
 $9 \text{rect}(5t) * \text{comb}(t) \xrightarrow{\text{FS}} (9/5)\text{sinc}(k/5)$, $T_F = T_0 = 1$
 $\frac{d}{dt}(9 \text{rect}(5t) * \text{comb}(t)) \xrightarrow{\text{FS}} j2\pi k(1)(9/5)\text{sinc}(k/5)$, $T_F = T_0 = 1$
 $\frac{d}{dt}(9 \text{rect}(5t) * \text{comb}(t)) \xrightarrow{\text{FS}} (j18\pi k/5)\text{sinc}(k/5)$, $T_F = T_0 = 1$
 $A = j18\pi/5 = j11.31$, $a = 1/5$