ECE581 Hmwk 9.

9-1 : (a).

X_1 / X_2	2	$\cos(t_1)-2$
2	$\frac{1}{3}$	0
$\cos(t_2)-2$	0	$\frac{2}{3}$

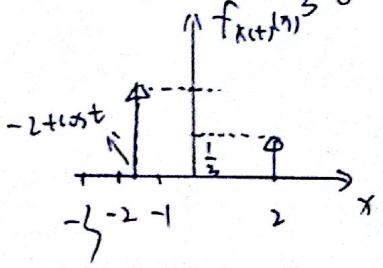
$\therefore R_X(t_1,t_2) = 4\cdot\frac{1}{3} + (\cos t_1 - 2)(\cos t_2 - 2)\frac{2}{3}$

$= \frac{4}{3} + \frac{2}{3}\cos t_1 \cos t_2 - \frac{4}{3}(\cos t_1 + \cos t_2)$

$+ \frac{8}{3} = 4 + \frac{2}{3}\cos t_1 \cos t_2 - \frac{4}{3}(\cos t_1 + \cos t_2)$

(b) (1) $f_{X(t)}(x) = \frac{1}{3}\delta(x-2) + \frac{2}{3}\delta(x-\cos t+2)$

(2)

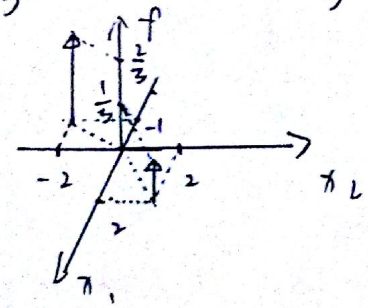


(c) (1) $f_{X(t_1)Y(t_2)}(x_1, x_2)$

$= \frac{1}{3}\delta(x_1-2)\delta(x_2-2) + \frac{2}{3}\delta[x_1-\cos(t_1)+2]\delta[x_2-\cos(t_2)+2]$

(2) $f_{X(0)X(\frac{\pi}{2})}(x_1, x_2)$

$= \frac{1}{3}\delta(x_1-2)\delta(x_2-2) + \frac{2}{3}\delta(x_1+1)\delta(x_2+2)$



(d). $R_X(0, \frac{\pi}{2}) = 4 - \frac{4}{3} = \frac{8}{3}$

$E[X(t_1)] = \frac{1}{3}\cdot 2 + (-1)\cdot\frac{2}{3} = 0$

$\therefore E[X(t_1)X(t_2)] \neq E[X(t_1)]E[X(t_2)]$

** correlated

9-2 : (a) $E[Y(t)] = E[X^2(t)]$

$= E^2[X] + \text{variance}$.

$= R_X(0) = E[X(t)X(t)]$

(b) $E[Y(t)] = 4 + 3 = 7$.

9-3 : (a) $E[X(k)]$

$= \cos(\omega_0 k) E[A]$

$= \eta_A \cos(\omega_0 k)$

(b) $E[X(k)] + E[X^2(k)]$

$= \text{variance}$

$= \eta_A^2 \cos^2(\omega_0 k) + \cos^2(\omega_0 k) E[A^2]$

$= \eta_A^2 \cos^2(\omega_0 k) + (\sigma_A^2 + \eta_A^2)\cos^2(\omega_0 k)$

~~$\sigma_A^2 \cos^2(\omega_0 k)$~~

$= \sigma_A^2 \cos^2(\omega_0 k)$

(c) not wss r.p.

because $E[X(k)]$

$\neq$ constant.