My Family

Tuesday
03

Week 2 / Day 3

Orthogonal Signal

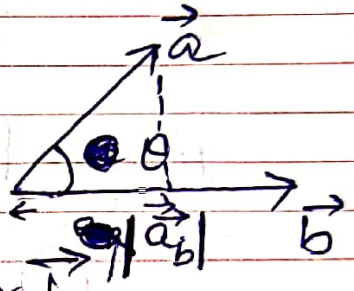
- **Orthogonality** ⇒ It is the Property that allows transmission of more than one signal over a common channel with successful detection.

My Friends

orthogonal signals ⇒ Two signals are said to be orthogonal if they are mutually independent.

My Health

orthogonal vector:



projection of vector $\vec{a}$ on vector $\vec{b}$

$$|\vec{a}_b| = |\vec{a}| \cos\theta$$

My Skills

if multiply the magnitude

$$|\vec{a}_b| \cdot |\vec{b}| \neq 0$$

$$|\vec{a}|\,|\vec{b}| \cos\theta \neq 0$$

So it is basically dot product of vector $\vec{a}$ and $\vec{b}$

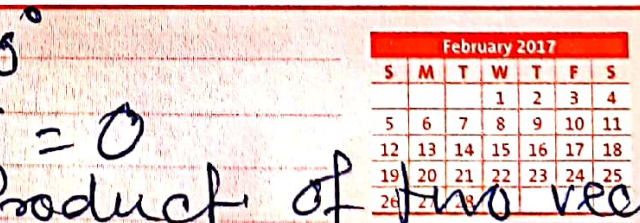
$$\vec{a} \cdot \vec{b} \neq 0$$

My Money

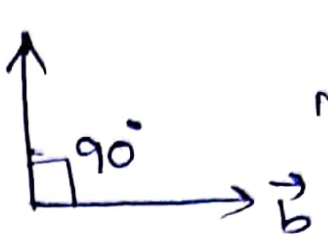
Notes: now $\theta = 90^\circ$

$$\vec{a} \cdot \vec{b} = 0$$

so when dot product of two vector are 0, then the vector



Scanned with CamScanner



Consider another vector $\vec{c}$ mutually independent

My Family

Wednesday 04

Week 2 / Day 4

are orthogonal vector.

$\vec{c} \cdot \vec{b} = 0$

My Friends

Now, for two signal are said to be orthogonal if

$$\int_{-\infty}^{\infty} x_1(t) x_2(t)\, dt = 0$$ if non Periodic Signal.

My Health

$$\int_{0}^{T} x_1(t)\, x_2(t)\, dt = 0$$ for Periodic Signal.

Property :-

$x_1(t) = \sin \omega_1 t + \varphi_1$ or $\cos \omega_1 t + \varphi_1$

$x_2(t) = \sin \omega_2 t + \varphi_2$ or $\cos \omega_2 t + \varphi_2$

① Harmonics component are always orthogonal

My Skills

i.e., $\omega_1 \neq \omega_2$ & $\varphi_1 \neq \varphi_2$

② $x_1(t) \sin(\omega_1 t + \varphi_1)$ & $x_2(t) = \cos(\omega_2 t + \varphi_2)$

if $\omega_1 = \omega_2$ & $\varphi_1 = \varphi_2$

then signal are orthogonal.

My Money

Notes:

Scanned with CamScanner

avg Power = $A\sin(\omega t+\phi)$ (Periodic signal)

$\rightarrow \frac{A^2}{2}$

B = ACC

January

Week 2 / Day 5

My Family

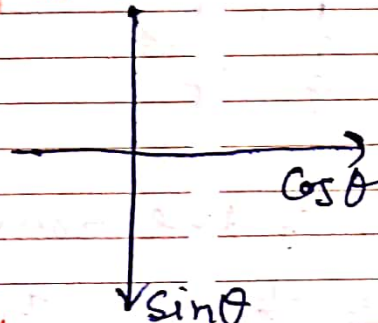
Thursday

05

(2) if the $\phi_1 - \phi_2 = \frac{n\pi}{2}$ then orthogonal.

$\sin\theta = \cos(\theta - 90^\circ)$

My Friends



(3) dc value and sin function always orthogonal.

$$\int_0^T a.\sin(\omega_0 t+\phi)\,dt = 0$$

My Health

(4) $x_1(t)$ and $x_2(t)$ orthogonal.

if $x_3(t) = x_1(t) + x_2(t)$

then avg power of $x_3(t)$, P_3,

$$P_3 = P_1 + P_2$$

and $E_3 = E_1 + E_2$

My Skills

Scanned with CamScanner