



**Arab Academy for Science & Technology and  
Maritime Transport – Cairo Branch**  
College of Engineering & technology  
Electronics & Communication Engineering Department



**Course:** Statistical Communication Theory

**Course Code:** EC421

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**Problem set:** 2

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**Weeks:** 4,5.

## Sheet 2

P1] Given the following random processes:

a)  $X(t) = a_c \cos(\omega_c t + \theta)$ , where  $\theta \rightarrow U[0, 2\pi]$ .

b)  $X(t) = a_c \cos(\omega_c t + \theta)$ , where  $\theta \rightarrow U[0, 2\pi]$ ,  $A_c \rightarrow U[-1, 1]$ .  
are independent random variables.

Perform the following:

- I. Check if the random process is Wide Sense Stationary (WSS).
- II. If the random process is WSS, determine the Power Spectral Density (PSD).
- III. Evaluate the DC power, the RMS value and the AC power.
- IV. Check if the random process is Ergodic.

P2] If A & B are two independent random variables with zero means and equal standard deviations, check the WSS and Ergodicity of the random process

$$X(t) = A \sin t + B \cos t.$$

P3] For the PSD's in figures, evaluate each of the DC & AC powers using both  $R_x(\tau)$  &  $S_x(f)$ .

