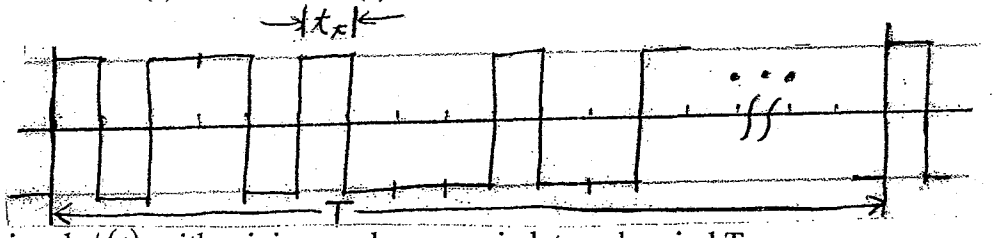
I will describe waveform $\phi(t)$ and signal $s(t)$ then I will ask a few questions.

Given $\phi(t)$ π_{rad} O_{rad}



A. Periodic signal $\phi(t)$ with minimum change period t_t and period T

a, b, k are integers
a = number of t_t intervals that are $+\pi$
b = number of t_t intervals that are O
k = a + b and $kt_t = T$

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B. Sinusoidal signal s(t) with frequency f_c

$f_c \gg 1/t_t$ and $\phi(t)$ represents phase of s(t)

1. Write a mathematical representation of s(t) either complex exponential or trigonometric representation.
2. Rough sketch s(t) showing important features
3. Is it possible to choose a and b such that there is no spectral component of s(t) at f_c in the frequency domain?
4. What is relationship between a and b for no spectral component of s(t) at f_c?
5. If $a \neq b$, what is the minimum possible spacing between spectral components of s(t)?
6. For $a \neq b$ in terms of a and b, what is the power of the spectral component at f_c compared to the total power in s(t)?
7. With a = b, i.e., no spectral component at f_c, how could you recover (estimate) f_c from s(t)?