Principles of communication systems

EET3202, CUNY City Tech, Fall 2023

Homework #06 (Due on Oct 12)

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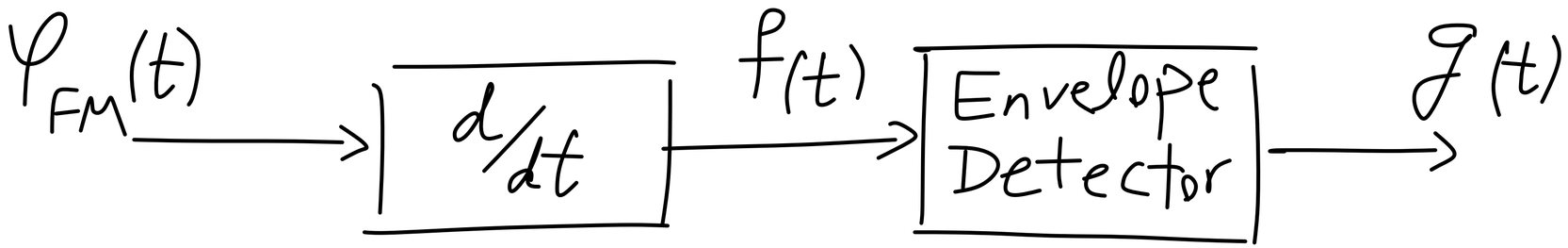
Problem 1

We have an FM radio receiver that demodulates FM signals using a differentiator and an envelope detector. Calculate f(t) and g(t) for each FM signal below.



a) $\varphi_{FM}(t) = A \sin\left(w_c t + k_f u(t) t \right)$

b) $\varphi_{FM}(t) = A \cos\left(w_c t + \frac{k_f \alpha}{w_m} \sin(w_m t) \right)$

Problem 2

Assume we want to sample and store the following signals. What is the minimum sampling rate (Nyquist rate) so that we can reconstruct the data successfully at a later time?

a) $f(t) = \text{sinc}(10t) = \frac{\sin 10\pi t}{10\pi t}$

b) $f(t) = A\cos(2\pi(7\times10^3)t + \theta) + B\sin(16000\pi t)$

c)