

# **Wireless Communications**

## Problem 1



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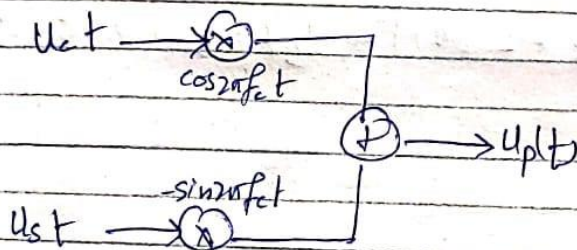
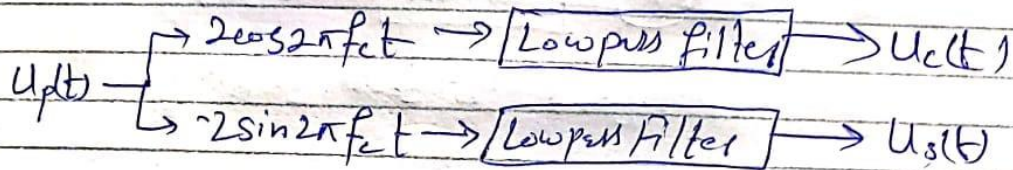
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Modulation process math model

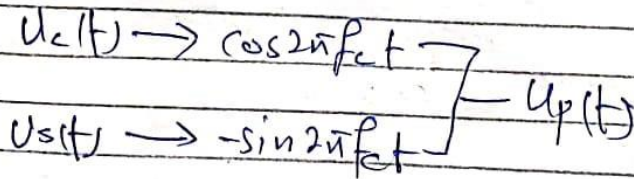
- passband  $\rightarrow$  baseband

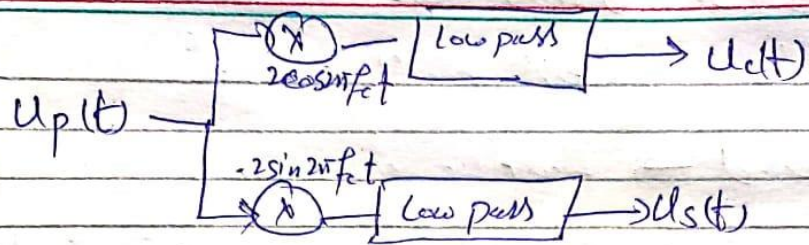


For Down convert from passband to baseband

$$\begin{aligned}
 2u_p(t)\cos(2\pi f_c t) &= 2u_c(t)\cos^2 2\pi f_c t - 2u_s(t)\sin 2\pi f_c t \\
 &= u_c(t) + u_c(t)\cos 4\pi f_c t - u_s(t)\sin 4\pi f_c t
 \end{aligned}$$

- Baseband  $\rightarrow$  passband





pass Band to base band.

$$u_p(t) = u_c(t) \cos(2\pi f_c t + \phi_c) - u_s(t) \sin(2\pi f_c t + \phi_c)$$



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END