6. **Modulation Overview:** (50 points)

Fill in the acronym for each type of modulation scheme listed below. From the choices provided on the following sheets, place the letters corresponding to the most appropriate transmitter block diagram (TX:), receiver block diagram (RX:), signal spectrum shape (Spectrum:), and key engineering trade-offs (Pro: and Con:) wherever prompted.

(1) PAM _____

TX: _____ RX: _____ Spectrum: _____ Pro: _____ Con: _____

(2) PCM _____

TX: _____ RX: _____ Pro: _____ Con: _____

(3) PWM _____ Pro: _____ Con: _____

(4) PPM _____ Pro: _____ Con: _____

(5) DSB-SC _____

TX: _____ RX: _____ Spectrum: _____ Pro: _____ Con: _____

(6) SSB _____

TX: _____ RX: _____ Spectrum: _____ Pro: _____ Con: _____

(7) QAM _____

TX: _____ RX: _____ Spectrum: _____ Pro: _____ Con: _____

(8) VSB _____

TX: _____ RX: _____ Spectrum: _____ Pro: _____ Con: _____

(9) DSB-LC _____ TX: _____ Spectrum: _____

RX with full-wave rectifier: _____ Pro: _____ Con: _____

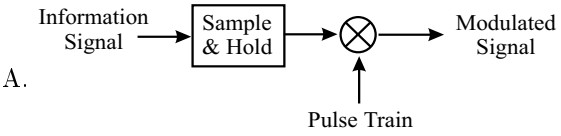
RX with half-wave rectifier: _____ Pro: _____ Con: _____

Below are the choices for the modulation review. For a given blank, pick the BEST answer from each category. Keep in mind the following rules and hints:

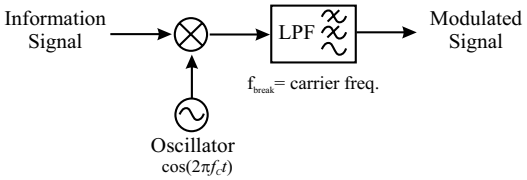
- There is only one right answer per blank, i.e. only the BEST answer gets credit.
- An answer from a specific category may be used more than once.
- All answers will be used, i.e. I did not put any bogus choices in any of the lists.

Transmitter (TX) Block Diagrams

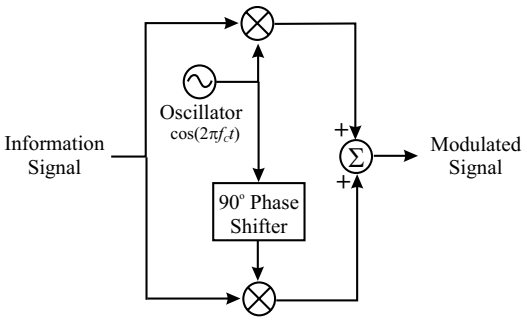
A.



B.



C.



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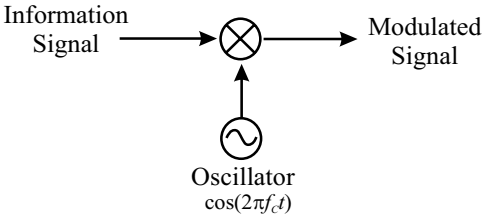
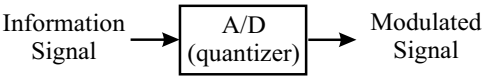
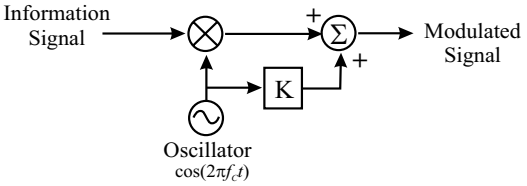


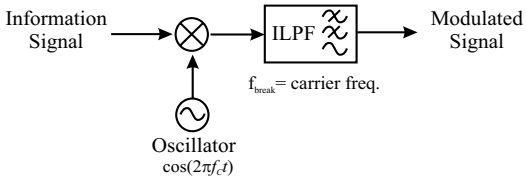
E.



F.

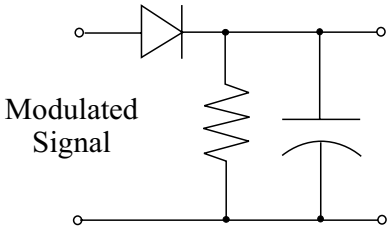


G.

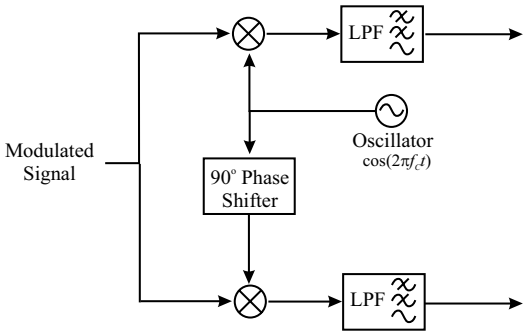


Receiver (RX) Block Diagrams

A.



B.



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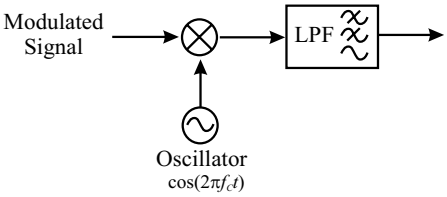

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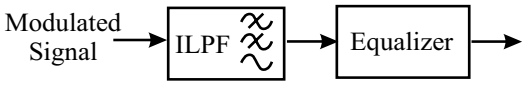
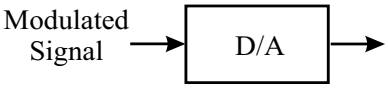
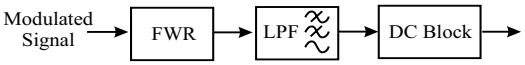
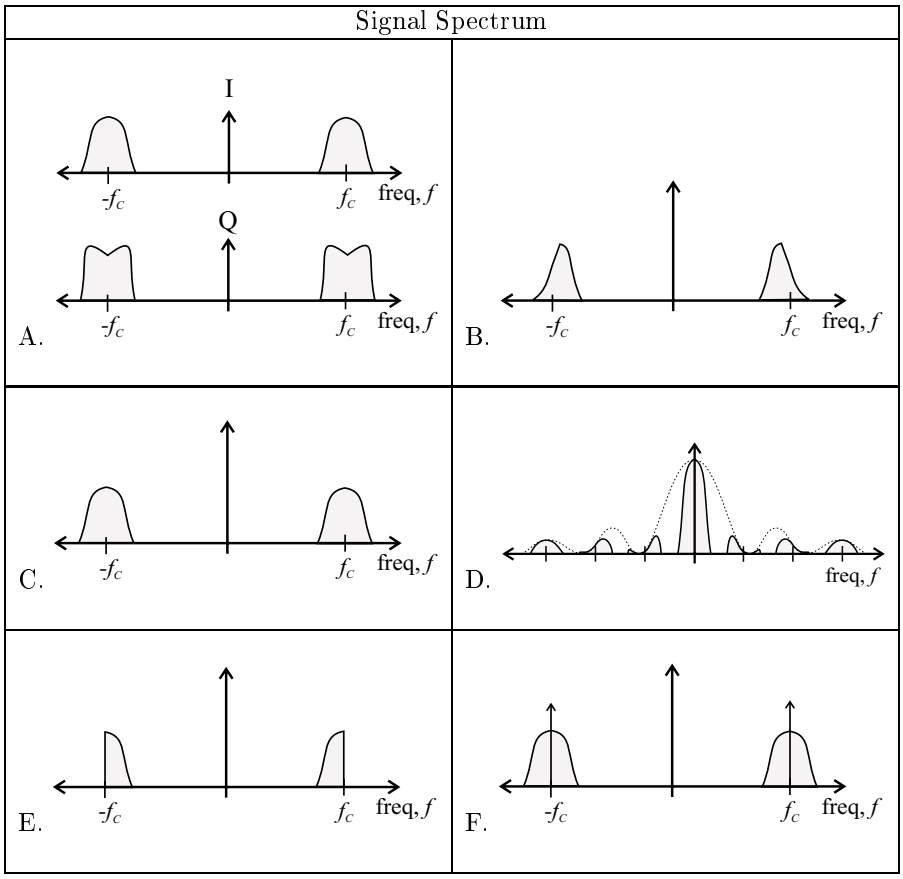


E.



F.





List of Modulation Pro's

A. Digital representation of a sampled signal is robust.
B. Cuts the AM signal bandwidth exactly in half.
C. The cheapest possible AM receiver.
D. Uses a realistic filter to reduce signal bandwidth by 20-40%.
E. A cheap type of AM receiver that outputs a lot of signal power.
F. Simple AM modulation that does not waste power transmitting a carrier.
G. Easy, bandwidth-efficient method for modulating samples at *baseband*.
H. Two channels available in the same bandwidth.
I. Baseband signal is resistant to fading and noise.

List of Modulation Con's

A. Requires a dual-channel, expensive type of receiver.
B. Power is wasted transmitting a carrier tone.
C. Signal is transmitted at baseband with a bandwidth larger than PAM.
D. The baseband receiver requires an equalizer.
E. Most bandwidth *in*efficient AM; needs a coherent receiver (i.e. PLL) to demodulate.
F. Requires a near-ideal filter to modulate the signal.
G. Reduced AM bandwidth is still sub-optimal.
H. Introduces quantization noise into a signal.

6. **Modulation Overview:** (50 points)

Fill in the acronym for each type of modulation scheme listed below. From the choices provided on the following sheets, place the letters corresponding to the most appropriate transmitter block diagram (TX:), receiver block diagram (RX:), signal spectrum shape (Spectrum:), and key engineering trade-offs (Pro: and Con:) wherever prompted.

(1) PAM Pulse Amplitude Modulation

TX: A RX: D Spectrum: D Pro: G Con: D

(2) PCM Pulse Code Modulation

TX: E RX: E Pro: A Con: H

(3) PWM Pulse Width Modulation Pro: I Con: C

(4) PPM Pulse Position Modulation Pro: I Con: C

(5) DSB-SC Double Sideband - Small Carrier (AM)

TX: D RX: C Spectrum: C Pro: F Con: E

(6) SSB Single Sideband (AM)

TX: G RX: C Spectrum: E Pro: B Con: F

(7) QAM Quadrature Amplitude Modulation

TX: C RX: B Spectrum: A Pro: H Con: A

(8) VSB Vestigal Sideband

TX: B RX: C Spectrum: B Pro: D Con: G

(9) DSB-LC Double Sideband Large Carrier TX: F Spectrum: F

RX with full-wave rectifier: F Pro: E Con: B

RX with half-wave rectifier: A Pro: C Con: B