

EE 302 PS 12 - SOLUTIONS

Chapter 9

Questions: 2, 11, 13

Problems: None

Critical Thinking: None

Additional Problems: 1, 2

Question 2

Cascading tuned circuits **increases selectivity** by narrowing the overall system pass-band. Additionally, it causes steeper “skirts” so that cascaded tuned have steeper sides.

Question 11

Mixer output typically is the difference between the **oscillator frequency** and the input (received) **signal frequency**.

Question 13

An interfering signal spaced by $2f_{IF}$ from the signal is called an “**image**.”

Additional Problem 1

1.a.

$$Q = \frac{f_r}{BW} = \frac{1100 \text{ kHz}}{10 \text{ kHz}} = 110$$

1.b/c. If Q is constant, then as f_r is raised, then BW must also increase; as f_r is lowered, BW must also lower to maintain constant Q . This is evident from the definition of Q :

$$Q = \frac{f_r}{BW}$$

For $f_r = 600$ kHz, $BW = f_r/Q = 5.45$ kHz (overly selective). For $f_r = 1600$ kHz, $BW = f_r/Q = 14.55$ kHz (this is under selective).

Additional Problem 2

2.a.

$$f_{IF} = f_o - f_s \longrightarrow f_o = f_{IF} + f_s = 455 \text{ kHz} + 1100 \text{ kHz} = 1555 \text{ kHz}$$

2.b. The local mixer produces images of the received AM signal centered at $f_o - f_s$ and $f_o + f_s$. These frequencies are 455 kHz and $1555 \text{ kHz} + 1100 \text{ kHz} = 2655 \text{ kHz}$, respectively.

2.c. 455; 10

2.d. No.