

FSE Quiz #2

Pyschoacoustics

Name:

1. In the context of the human ear, what does it mean to say it is a non-linear system?

A: Any of the following would be satisfactory answers:

There is not a 1:1 correspondence of input to output. The active processes in the ear can cause spurious sonic perceptions. Perception of both frequency and amplitude is logarithmic, and frequency perception depends on the level of the sound.

2. What is acoustic reflex? When might your ears exhibit this ability?

When exposed to uncomfortably loud sounds, muscles in the middle ear contract to protect the inner ear. The stapes and the malleus are drawn away from the timpanic membrane and oval window, resulting in decreased transmission of acoustical energy into the inner ear.

This is most likely to happen when an acoustic stimulus is lower in frequency and slower in onset (i.e. slowly walking toward a construction site with a jackhammer).

3. Give an example of a situation where the masking phenomenon might occur.

The masking phenomenon is essentially one sound making it more difficult to distinguish other sounds in the environment. Low-mid frequency sounds are more effective maskers of high frequency sounds. The masker does not need to be as loud as the sound it is masking.

This is used in audio encoding, in which sounds that will not be perceived are removed from an audio file in order to decrease the file size. It also occurs every time the HVAC system engages in our lecture room.

4. When listening to a signal at constant sound pressure level (no change in amplitude), increasing the frequency bandwidth of the signal will make the sound appear louder or quieter?

Louder

5. Due to the sample rate of the auditory nerve, humans cannot distinguish melodies if the frequency of the sound is above what threshold?

5,000 Hz

6. A cello playing a 440Hz tone and a trumpet playing a 440 Hz tone sound very different. The quality of sound that gives each instrument its unique "color" is called timbre (pronounced tam-ber). What are some of the characteristics of sound that contribute to timbre?

Harmonic content (frequency envelope) is the main component of timbre we have discussed thus far, though the dynamic envelope (attack, sustain, release and decay) are also key in giving each instrument its unique sound, even when the same fundamental frequency is played.