SOUND DESIGN & PRODUCTION COURSE

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# Questions with answers

*Identify and list out five characteristic sounds which you hear at a bus station (Marks 5)*

Ans:

* Engine noises of various pitch and amplitude corresponding to different vehicles
* High frequency sound Screeching of bus tyres while applying break
* Footsteps and body rumbles of people walking
* Murmuring and/or people talking loudly on their phones
* Screaming vendors

*Write short notes on (any* ***three****) (Marks – 5\*3 = 15)*

1. Doppler effect

Ans: When wave energy like sound or radio waves travels from two objects, the wavelength can seem to be changed if one or both are moving. This is called the Doppler effect.

The Doppler effect causes the received frequency of a source (how it is perceived when it gets to its destination) to differ from the sent frequency if there is motion that is increasing or decreasing the distance between the source and the receiver. This effect is readily observable as variation in the pitch of sound between a moving source and a stationary observer. Imagine the sound a race car makes as it rushes by, whining high pitched and then suddenly lower. Vrrrm-VROOM. The high-pitched whine is caused by the sound waves being compacted as the car approaches you, the lower pitched VROOM comes after it passes you and is speeding away. The waves are spread out.

1. Resonance

Ans: Musical instruments are set into vibrational motion at their natural frequency when a person hits, strikes, strums, plucks or somehow disturbs the object. Each natural frequency of the object is associated with one of the many standing wave patterns by which that object could vibrate. The natural frequencies of a musical instrument are sometimes referred to as the harmonics of the instrument. An instrument can be forced into vibrating at one of its harmonics (with one of its standing wave patterns) if another interconnected object pushes it with one of those frequencies. This is known as resonance - when one object vibrating at the same natural frequency of a second object forces that second object into vibrational motion.

1. Standing waves

Ans: A standing wave pattern is a vibrational pattern created within a medium when the vibrational frequency of the source causes reflected waves from one end of the medium to interfere with incident waves from the source. This interference occurs in such a manner that specific points along the medium appear to be standing still. Because the observed wave pattern is characterized by points that appear to be standing still, the pattern is often called a standing wave pattern. Such patterns are only created within the medium at specific frequencies of vibration. These frequencies are known as harmonic frequencies, or merely harmonics. At any frequency other than a harmonic frequency, the interference of reflected and incident waves leads to a resulting disturbance of the medium that is irregular and non-repeating.

1. mp3

Ans:MP3 (MPEG-1 Audio Layer-3) is a standard technology and format for compressing a sound sequence into a very small file (about one-twelfth the size of the original file) while preserving the original level of sound quality when it is played.

MP3 provides near CD quality audio. It is one of the most common music file types. It is not an MPEG 3 but uses the audio compression found in layer III in MPEG 1 or 2 video files, the audio stream layer. The name MPEG is derived from the Moving Picture Experts Group and was created by the Fraunhofer Institute in Germany in 1991. Sound quality varies by such settings as bit rate (fixed or variable), sample rate, joint or normal stereo. Mp3 has a proposed replacement in MP3pro with better sound for a given file size.

1. HDMI

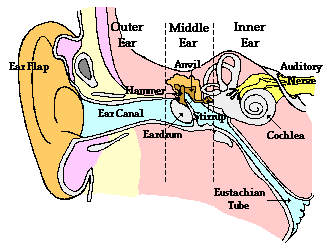
Ans:Stands for "High-Definition Multimedia Interface." HDMI is a trademark and brand name for a digital interface used to transmit audio and video data in a single cable. It is supported by modern audio/video equipment, such as 4K televisions, HDTVs, audio receivers, DVD and Blu-ray players, cable boxes, and video game consoles.

While other types of A/V connections require separate cables for audio and video data, a single HDMI cable carries the audio and video streams together, eliminating cable clutter. For example, an analog component cable connection requires three cables for video and two for audio, totaling five cables in all. The same information can be transmitted digitally using one HDMI cable.

*Explain briefly the working of human ear. (Marks – 5)*

Ans:

The ear consists of three basic parts - the outer ear, the middle ear, and the inner ear. Each part of the ear serves a specific purpose in the task of detecting and interpreting sound.



The pinna collects the sound waves from the surroundings and sends it to ear canal. The ear canal sends the sound waves to the ear drum and send it to middle ear. The hammer, anvil and stirrup amplify the sound waves and send it to cochlea. The cochlea receives the vibrations and convert it into electric impulse and send it to auditory nerve. The auditory nerve sends these waves to the brain.

*What are compressed and non-compressed formats in digital sound? Give examples. (Marks -5)*

Ans: Uncompressed audio is audio without any compression applied to it. This includes audio recorded in PCM or WAV form.

Lossless audio compression is where audio is compressed without losing any information or degrading the quality at all. Examples of lossless formats includes WMA Lossless or FLAC in Matroska.

Lossy audio compression attempts to apply to discard as much 'irrelevant' data as possible from the original audio, thereby producing a file much smaller than the original that sounds almost identical. This results in a much smaller filesize then lossless or uncompressed audio. Lossy audio formats include AC3, DTS, AAC, MPEG-1/2/3, Vorbis, and Real Audio.

*Write short notes on (any* ***four****) (Marks – 2.5\*4 = 10)*

Pitch Shift

Pitch shifting is a sound technique in which the original pitch of a sound is raised or lowered. Effects units that raise or lower pitch by a pre-designated musical interval (transposition) are called pitch shifters or pitch benders.

A harmonizer is a type of pitch shifter that combines the "shifted" pitch with the original pitch to create a two or more-note harmony.Pitch scaling is the process of changing the pitch without affecting the speed.

Reverberation

A reverb is created when a sound or signal is reflected causing a large number of reflections to build up and then decay as the sound is absorbed by the surfaces of objects in the space – which could include furniture, people, and air. This is most noticeable when the sound source stops but the reflections continue, decreasing in amplitude

Reverberation is frequency dependent: the length of the decay, or reverberation time, receives special consideration in the architectural design of spaces which need to have specific reverberation times to achieve optimum performance for their intended activity.

Octave

Because a doubling of frequency corresponds to an octave increase of pitch, it follows that there is no constant increment of frequency that always corresponds to a one-octave increment of pitch. That is to say, there is no fixed amount by which a frequency can be augmented that will always produce a one-octave pitch rise.

For instance, starting at the pitch A4 with a frequency of 440 Hz, we need to augment the frequency by 440 Hz to get the pitch one octave above (880 Hz). But a further augmentation of 440 Hz does not take us to the next A. We need an augmentation of 880 Hz to reach the next A. Clearly the frequency steps get bigger as the frequency (and pitch) get higher.

Audio Equalizer

Different frequency bands are attenuated or boosted to produce desired spectral characteristics. Moderate use of equalization ("EQ") can be used to "fine-tune" the tonal quality of a recording; extreme use of equalization, such as heavily cutting a certain frequency can create more unusual effects.

Filtering - Equalization is a form of filtering. In the general sense, frequency ranges can be emphasized or attenuated using low-pass, high-pass, band-pass or band-stop filters. Band-pass filtering of voice can simulate the effect of a telephone because telephones use band-pass filters

*How do sound effects, music and spoken words help to shape a film? Explain with suitable examples. (Marks – 10)*

Ans:

Sound effects can be used to add mood or atmosphere to a film by creating a soundscape that accents or adds another layer of meaning to the images on the screen. Pitch, tempo, and volume may be altered to indicate how the filmmaker expects the audience to respond to a given noise. For instance, high-pitched sounds, including screams or squealing tires, help to create a sense of anxiety, while low-pitched sounds, including the sounds of waves or the swinging of a door, can be used to create a sense of calm or mystery.

Perhaps the most interesting use of sound in a movie is the very absence of it: silence. At key points in a film, directors may use silence in much the same way that they would use a freeze frame. Both tend to arrest the audience’s attention to highlight some action or change in story direction. Silence can be used to build up a scene’s intensity or to foreshadow impending doom.

In recent years, special sound effects have been added to movies in order to heighten the film experience. Many of these sound effects, including explosions, phaser blasts, wind, and animal sounds are drawn from computer sound effects libraries and are added to a lm after the movie has been shot. Besides creating louder and more dramatic movies, these effects have tended to draw more attention to movie sound. With advancements in surround sound, sound effects have developed a more “directional” element, appearing to come from a specific place or direction. This directional quality of sound (alongside elements such as echoes) enhances a three-dimensional sense of space in the movie.

Music is one of the most peculiar conventions in movies. No one questions that music should be a part of movies because we’ve all grown used to the idea that, in a movie, when two people kiss, we should hear music in the background. Or when the platoon attacks the beach, a symphony should provide the inspiration behind their assault. Of course, no one has a soundtrack accompanying their real lives. But in movies we not only accept this convention, we demand it.

Music can be used for a number of effects in a movie. The most obvious way music scores are used is to guide the emotional response of the audience. They provide clues, or, in most cases, huge signposts, that tell audiences how the filmmaker wants them to react to a given scene.

Some directors play against our expectations and use music in ways we might not expect. Stanley Kubrick shocked audiences when he used “Singin’ in the Rain” as the backdrop to a horrible rape scene in A Clockwork Orange (1971).

Music can also provide an overture for a movie when it’s used as the backdrop for the opening credits. The brassy theme music composed by John Williams for Star Wars is one famous and often-parodied example.

In some instances, directors use music to foreshadow upcoming events. In horror movies, for example, the score is often used to build up tension and suspense just before the monster attacks one of its victims.

Finally, music can be used to shape the ethnic or cultural context of a film.

In addition to giving voice to the characters in a movie, two of the more interesting ways the spoken word can shape a movie are through voice-overs and by providing subtext to a scene. Voice-overs are typically used in documentary films, although they occasionally turn up in fiction films such as the original Blade Runner (1982), to provide background to a story or to help move a story from one set of events to another.

Used well, voice-overs can be unobtrusive. Used poorly, voice-overs can often seem like “the voice of god”, bringing forth wisdom audiences are supposed to accept unquestioningly. For this reason, some filmmakers refuse to use voice-overs in their films to let audiences have more freedom in determining what the meaning of the film is.

We all know from our own personal conversations that there is often a subtext to the words we hear. Subtext means there is an implicit meaning standing behind the language we actually hear. In film, actors use this element of language to shape a scene without actually saying what they mean.

Similarly, some actors are known for their distinctive voices which have helped define the characters they play. Marilyn Monroe is remembered for her high-pitched breathy voice, which gave a slightly ditzy feel to many of her characters, while John Malkovich has a distant, aloof, and direct manner of speech which helps to give a sinister edge to many of his best on-screen performances.

5. Describe any **one** location in terms of its sounds. Mention at least five different sounds and theirqualities present in that location. (Marks/10)

Location: Inside a metro train

Sounds: Sound of train engine, sound of train running on tracks, footsteps, earphone bleed, people watching videos (without headphones), distant murmuring and high intensity conversations, foot tapping/handle tapping, rumbles, announcements, breathing, paper flutter, door open/close warnings, ringing phone, whooshing air

5. *Answer any* ***one*** *of the following – (Marks – 5)*

1. What are sound waves? Explain how sound travels from one position in air to another?

Ans: Sound is the energy things produce when they vibrate (move back and forth quickly). If you bang a drum, you make the tight skin vibrate at very high speed (it's so fast that you can't usually see it), forcing the air all around it to vibrate as well. As the air moves, it carries energy out from the drum in all directions. Eventually, even the air inside your ears starts vibrating—and that's when you begin to perceive the vibrating drum as a sound. In short, there are two different aspects to sound: there's a physical process that produces sound energy to start with and sends it shooting through the air, and there's a separate psychological process that happens inside our ears and brains, which convert the incoming sound energy into sensations we interpret as noises, speech, and music. We're just going to concentrate on the physical aspects of sound in this article.

Sound is like light in some ways: it travels out from a definite source (such as an instrument or a noisy machine), just as light travels out from the Sun or a light bulb. But there are some very important differences between light and sound as well. We know light can travel through a vacuum because sunlight has to race through the vacuum of space to reach us on Earth. Sound, however, cannot travel through a vacuum: it always has to have something to travel through (known as a medium), such as air, water, glass, or metal.

There is one crucially important difference between waves bumping over the sea and the sound waves that reach our ears. Sea waves travel as up-and-down vibrations: the water moves up and down (without really moving anywhere) as the energy in the wave travels forward. Waves like this are called transverse waves. That just means the water vibrates at right angles to the direction in which the wave travels. Sound waves work in a completely different way. As a sound wave moves forward, it makes the air bunch together in some places and spread out in others. This creates an alternating pattern of squashed-together areas (known as compressions) and stretched-out areas (known as a rarefactions). In other words, sound pushes and pulls the air back and forth where water shakes it up and down. Water waves shake energy over the surface of the sea, while sound waves thump energy through the body of the air. Sound waves are compression waves. They're also called longitudinal waves because the air vibrates along the same direction as the wave travels.

1. What are the Harmonics? Explain in relation to harmonics, why the same notes played on two different musical instruments have a different tonal quality?

The natural frequencies of a musical instrument are sometimes referred to as the harmonics of the instrument. An instrument can be forced into vibrating at one of its harmonics (with one of its standing wave patterns) if another interconnected object pushes it with one of those frequencies.

This is because musical instruments do not vibrate at a single frequency: a given note involves vibrations at many different frequencies, often called harmonics, partials, or overtones. The relative pitch and loudness of these overtones gives the note a characteristic sound we call the timbre of the instrument.

*4. Imagine that you are sitting at a sea shore in the evening around 6pm. Identify and name the 5 sound elements in the form of character, effects and ambience according to your point of view. (Marks – 5)*

Ans: High tides, receding waves, breeze, rustling of leaves (if trees are nearby), birds chirping, murmur etc.

2. *Choose the correct answers (Marks – 1 \* 5 = 5)*

1. Sound waves have
   1. *Amplitude only*
   2. *Frequency and wavelength only*
   3. *Amplitude, frequency and wavelength*
   4. *Amplitude and wavelength only*
2. When we change feeble sound to loud sound, we increase its
   1. *Frequency*
   2. *Wavelength*
   3. *Amplitude*
   4. *Velocity*
3. When sound travels through air, the air particles –
   1. *Vibrate along the direction of propagation*
   2. *Vibrate but not in any fixed direction*
   3. *Vibrate perpendicular to the direction of wave propagation*
   4. *Do not vibrate*
4. A microphone
   1. *Converts sound waves to radio signals*
   2. *Converts sound waves to fluctuating electric current*
   3. *Converts audio-frequency currents to a fluctuating magnetic field*
   4. *None of the above*
5. The period of a vibrating body of frequency 100 Hz is
   1. *100 sec*
   2. *10 sec*
   3. *0.1 sec*
   4. *0.01 sec*

3. *Write short notes on the following topics (Any two) (Marks – 5)*

1. *Diffraction*
2. *Resonance*
3. *Sync sound*
4. *Equalizer*

# FTII Questions - discussed in class (refer to videos)

*1. Make a list of ten sound effects (avoid dialogues) to develop a night sequence set in a small*

*hotel on a highway. (Marks – 10)*

*2. Briefly discuss the differences in sound experience while watching a film in a cinema hall, in amultiplex, on television set and on your mobile phone. (Marks – 10)*

*3. Why do you avoid having a serious talk in a big empty room? (Marks – 5)*

*4. Giving one example, explain how music helps emoting sequences of fiction. (Marks – 5)*

*5. Give examples of different types of natural sounds which create the following feelings in your*

*mind: (Marks – 2 \* 5 = 10)*

*a) Happiness*

*b) Fear*

*c) Sadness*

*d) Tension*

*e) Funny*

*6. Describe the sound track of any film / program which you liked from the point of view of*

*sound designing. (Marks – 10)*

*7. What are the characteristics you have noticed inside an auditorium while listening to a*

*musical program? (Marks – 5)*

*(Hint: Auditorium treatment and surround sound)*

*8. Why does your song in bathroom sound nice? (Marks – 5)*

*(Hint: concept of reverb)*

*9. Does sound follow the same laws of reflection as light does? Explain. (Marks – 5)*

*10. The soundwave travels at a speed of 340 meters/second. If its wavelength is 2cm. What is the frequency of the wave? Will it be audible? (Marks – 5)*

*11. Explain how sound could be used creatively in varied situations to achieve audio-visual harmony, with examples from a recently watched film, when necessary. (Marks – 10)*

*12. What are the factors that you will consider, while designing an auditorium? (Marks – 5)*

*13. What are the differences between documentary film sound and feature film sound? Elucidate with examples. (Marks – 10)*

*14.*

1. A film seen in a cinema hall and the same film seen on TV, sounds different. Explain the difference in sound quality and experience. (Marks 10)
2. In the rainy season, when there is a thunder storm, the flash of lightening is seen first, and its rumble is heard a little later. Give reasons and explain the audible effect in brief. (Marks 10)

*15. Compare the sounds of a diesel train and a jet plane. What can you infer from just listening totheir sounds? (Marks-10)*

*16. Give important details of three to four sound related equipment that you have seen or used. (Marks – 5)*

17. What will be the sound that you hear if you shout: (Marks/10)

i) in an empty large room?

ii) at the mouth of a well?

iii) from the top of a building?

iv) in a bathroom?

18. When loud music is played in a closed room, we get to hear only the bassy sound outside. Whydoes this happen? (Marks - 10)

19. Read the story below and list out **ten** sounds that you can expect to hear as the story unfolds.

(Marks-10)

Once Emperor Akbar asked his courtiers a strange question. The courtiers were all dumb

founded by this question.

Akbar glanced at the courtiers. As he loaded, one by one, the heads began to hang low in search

of an answer. It was at this moment that Birbal entered the courtyard. Birbal asked, ‘May I know the question so that I can try for an answer.’

Akbar said, ‘How many crows are there in this city?’

Without a moment's hesitation, Birbal replied. ‘There are fifty thousand five hundred and eighty

nine crows, my Lord’. ‘How can you be so sure?’ Asked Akbar.

Birbal said, ‘Make your men count, My Lord. If you find more crows, it means some have to

visit their relatives here. If you find less number of crows, it means some have gone to visit their

relatives elsewhere

20. There is a choice of recording 10 (ten) violins playing simultaneously and recording a single

violin and duplicating its recording ten times. What would you prefer? Justify your answer with

an example. (Marks/10)

21. Name any one film where the sound design left you impressed. Give the name, the cast and the credits, and your reasons for choosing this film. (Marks-10)

22. *Describe with justifications the different situations in which following types of sound can be creatively used rather than realistically (Any* ***five****) (Marks – 4\*5 = 20)*

1. The effect of reverberation given to any character’s voice in fiction type of programs.
2. The effect of echo given to any character’s voice in fiction type of programs.
3. Silence followed by extremely loud sound
4. Extremely loud sound followed by silence
5. Same tune of music being used repeatedly
6. Very harsh irritating sound
7. Exaggeration of sounds means using sounds at quite high level than their normal level in real life.
8. Birds fluttering.

24. *Describe a scene visually from any program (Film or Television) which has an impact on you so as to pursue this course. (Marks – 5)*

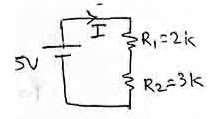
25. *Answer any 6 questions: (Marks 5 \* 6 = 30)*

1. What is rhythm? Give examples of five natural rhythmic sounds (not musical instruments).
2. Two instruments guitar and piano are playing the same note, yet they sound different. Explain.
3. What are transducers? Briefly explain about input transducers and output transducers with respect to sound.
4. Briefly explain the difference between Analogue audio and Digital audio.
5. Represent graphically by two separate diagrams in each case:
   1. Two sound waves having the same amplitude but different frequencies
   2. Two sound waves having same frequency but different amplitudes
   3. Two sound waves having different frequencies and different amplitudes
6. An echo returns in 3 seconds. What is the distance of the reflecting surface from the source, given that the speed of sound is 342 m/s?
7. Can sound suggest space and time? Explain.
8. What is Doppler effect?

*26. Answer the question in around two pages. Briefly explain your observations of a TV program where you think that sound has been used creatively. (Marks – 10)*

# FTII Questions -Basic PhysicsNumerical

1. *Choose the correct alternative from the four options given for each of the following: (Marks 1 \* 5 = 5)*



1. If V = I.R, the current I in the above circuit will be
   1. 1 A
   2. 1 mA
   3. 5 A
   4. None of these
2. If a man standing in front of a hill hears the reflection of his sound after 2 seconds, he is standing at a distance of ….. from the hill. (Speed of sound = 340m/s)
   1. 340m
   2. 680m
   3. 170m
   4. 85m
3. The size of a Digital Audio of 1 minute duration recorded in Audio CD format will be very close to
   1. 10.584 MB
   2. 5.292 MB
   3. 256 MB
   4. 2.56 MB
4. If the output voltage produced by an amplifier with a gain of 120 is 24V, the input voltage applied to it is
   1. 24mV
   2. 200mV
   3. 2mV
   4. 2400mV
5. If the speed of data is 128 kbps, the data in bytes sent over the network in 8 seconds will be
   1. 128 KBytes
   2. 256 KBytes
   3. 64 KBytes
   4. 512 KBytes

# Possible questions - to be solved on your own

*1. How has digital technology revolutionized sound design, recording and production. Explain.*

*2. Give a brief overview of Digital Audio Workstations with some examples.*

*3. What is psychoacoustic modeling?*

*4. What are low frequency oscillators? How can sound designers use them creatively?*

*5. What are reinforced sounds? What is surround sound?*

*6.Explain briefly the working of an amplifier.*

*7. Answer the following questions briefly: (Marks – 10)*

1. Distinguish between the following Digital Storage Media
   1. Hard Disk
   2. Digital Audio Tape
   3. Memory Card
2. Explain how the Digital technology has revolutionized the field of sound recording in terms of its –
   1. Portability
   2. Compression
   3. Quality