DETAILED SYLLABUS FOR THE POST OF *ASSISTANT RECORDIST IN KERALA STATE FILM DEVELOPMENT CORPORATION AND RECORDING ASSISTANT IN KERALA STATE FILM DEVELOPMENT CORPORATION*

(Cat. Nos: 251/2023, 436/2023)

Module 1 (*5 marks)*

Basic Physics of Sound

a) Sound as an Acoustic (Mechanical) Waveform

Comparison of transverse waves and longitudinal waves, examples of transverse waves & longitudinal waves, comparison of sound waves with electromagnetic waves, how a sound wave travels from one point to another, why sound waves are also known as pressure waves, sound field and wavefront, why sound cannot travel through vacuum, components of a sound wave (pressure & velocity), definition of a point source.

b) Physical characteristics of a Sound Wave

Frequency, wavelength, amplitude, velocity of a wave, mathematical relationship between the frequency, wavelength and velocity of a sound wave, velocity of sound waves in different media, factors that affect the velocity of sound in any medium, phase of a wave, how phase affects what we hear, comparison of sine waves & complex waves, audible frequency range of the human ear, addition of sound waves in phase and out of phase, intensity of a wave, Equal Loudness Curves (Fletcher- Munsor curves), fundamental frequency & harmonics, sine waves, square waves & triangular waves, pitch, timbre.

Module 2 (*5 marks)*

Basic Acoustics

a) Acoustic behaviour of a sound wave when it encounters obstacles

Reflection, refraction, diffraction, absorption, dispersion, applications of reflection, absorption and diffraction in acoustic design of recording studios,

theatres, auditoriums and loudspeaker cabinets, definition of echo, factors that are necessary to perceive echo.

b) Acoustic Parameters of a Sound Wave

Definition of the inverse square law, description of the decibel (dB), why the decibel is used in acoustic measurements, Comparison of Sound Intensity Level (SIL), Sound Power Level (SWL) and Sound Pressure level (SPL), different contexts in which SIL, SWL and SPL are used, how SPL is measured using a sound level meter, features of a sound level meter, time domain & frequency domain representations of a sound wave (*as seen on an oscilloscope and a spectrum analyzer)*

c) Acoustic Behaviour of Sound Waves in an Enclosed Space

Reverberation & Reverb Time (RT60), how reverberation affects the perception of sound, comparison of echo and reverberation, anechoic chamber and its applications, comparison of free field and diffuse field, comb filtering, flutter echoes, standing waves, conditions that result in standing wave formation, resonance, controlling standing waves in studios, recording rooms and theatres, resonance in musical instruments, the Precedence effect and the Law of the First Wavefront, Resonance in electroacoustic devices (microphones & loudspeakers)- how resonance affects the performance of microphones and loudspeakers.

Module 3 (15 *marks)*

Microphones and their Applications

a) Classification of microphones based on Acoustic Response

Pressure microphones & Pressure Gradient microphones, polar patterns (directional properties) of microphones, different parts of a microphone and the function of each part, Proximity Effect in pressure gradient microphones.

b) Classification of Microphones based on Transducer Design

Dynamic (moving coil), Condenser (electrostatic) and Ribbon microphones, characteristics of the three types of design, differences & similarities between dynamic (moving coil) and ribbon microphones, RF condenser microphones, Electret

condenser microphones, different situations where the three types can be used effectively, Shotgun Microphones and their applications, how variable polar patterns are obtained in condenser microphones, different methods of powering condenser microphones.

c) Working principles of Stereo Microphones

Different classifications of stereo microphones (L/R & M/S), conversion from L/R to M/S and viceversa, applications of stereo microphones, compatibility with mono reproduction systems, stereo monitoring with loudspeakers and headphones, conversion from M/S to L/R on an audio mixer and in a DAW.

d) Special Purpose Microphones

Binaural microphones, parabolic microphones, pressure zone (boundary) microphones, headset microphones, contact microphones, radio (wireless) microphones, sound transmission & reception using radio microphones, wired lavalier (lapel) microphones,

e) Microphone Specifications

Frequency response, signal to noise ratio, dynamic range, impedance, sensitivity, self noise and distortion characteristics of all categories of microphones, how impedance affects the performance of microphones, impedance matching between microphones and mixers/pre-amplifiers

f) Sound as an Electrical Signal

How sound is converted to an electrical signal in a microphone, Ohms Law, electrical power equations, measurement of sound in electrical form (dBu, dBV, dBv & dBm), transmission of sound along cables, mic and line cables, balanced and unbalanced connections, impedance matching between audio devices, basic principles of transformers, role of transformers in audio circuits, RMS, peak and average values, mathematical relationship between, VU meters and peak program meters (PPM).

Module 4 (15 *marks)*

Audio Mixers

a) Basic layout of an Analogue Mixer

Various controls seen on an analogue mixer, input & output connections on an analogue mixer, signal flow path, patching & routing options in mixers, different classifications of mixers based on design (inline & split consoles), working of filters, parametric equalizers, graphic equalizers, compressors and limiters, connecting external signal processing devices to mixers, input and output impedance of a mixer, signal to noise ratio and dynamic range of a mixer, frequency response, sound level meters on analogue mixers, comparison of location sound mixers and studio mixers.

b) Digital Audio Mixers

Basic working principles of digital audio mixers, comparison of digital mixers with analogue mixers in terms of design and working, digital mixers as control surfaces, inputs and outputs on a digital mixer, different types of fader automation, technical specifications of digital audio mixers, signal routing in digital audio mixers.

Module 5 (10 *marks)*

Amplifiers & Loudspeakers

a) Classifications of Amplifiers

Different classes of amplifiers based on electronic design characteristics, basic controls seen on an amplifier, headphone amplifiers, microphone pre- amplifiers, power amplifiers, technical parameters of amplifiers.

b) Loudspeakers

Different classifications of loudspeakers, basic loudspeaker design, working of a loudspeaker as an electroacoustic device, active & passive crossover networks in loudspeakers, active & passive loudspeaker design, bass boost mechanisms in loudspeakers.

c) Technical specifications of loudspeakers

Frequency response, dynamic range, signal to noise ratio (S/N) power handling capability, sensitivity, power output in watts.

d) Loudspeakers for Different Applications

Loudspeakers for various applications such as studio recording, PA systems, theatres, auditoriums, conference rooms etc, how room acoustics affects loudspeaker monitoring, importance of loudspeaker positioning in a studio, comparison of near field monitoring & far field monitoring

Module 6 (1*5 marks)*

Sound Workflow in Film/Television Production

a) ***Sound workflow in classic film model***- Shooting on film at 24 FPS and releasing on film- Recording sound on location using analogue recorder (Nagra) and doing picture edit on film (Moviola or Steenbeck), sound post-production on magnetic film recorders and finally releasing on film.

b) ***Sound workflow in film/video hybrid model***- Shooting on film and working in video /NLE environment and final release on film- different methods of recording sound on location and doing post-production in video environment, releasing final film on celluloid.

c) ***Sound workflow in digital cinema***- Shooting in digital format at 24 FPS and final release on film or digital format (DCP)- Recording sound on location in digital format, post-production and final release in digital format (DCP) for theatrical screening.

Module 7 (1*5 marks)*

Analogue & Digital Recording

a) Basic Principles of Analogue Recording

Definition of analogue recording, history of analogue recording, the different media on which analogue recording has happened, basic working principles of optical film recorders and magnetic tape recorders, location recorders (Nagra), differences between working of sprocketed (magnetic film recorders) tape recorders and non-sprocketed tape recorders, synchronization of magnetic film recorders with film projectors, merits and demerits of optical and magnetic recorders, different magnetic tape formats used for professional recording, magnetic tape formats for consumer use, important components of a magnetic tape recorder, sound reproduction.

b) Basic Digital Audio

Evolution of digital recording systems over the years, Audio interfaces analogue to digital converters (A/D) and digital to analogue converters (D/A), sampling rate, bit size, quantization, oversampling, dither, aliasing & anti-aliasing filters, error correction in digital audio systems, calculation of storage space requirement using sampling rate & bit size, different types of digital audio files,

Digital audio interfaces (AES,SDI, SPDIF, MIDI Dante etc), transmission of digital audio over cables and networks, interconnection of musical instruments using MIDI, tape based digital recording and tapeless digital recording systems (DAW- Digital

Audio Workstation), buffering in digital systems, exchange of files between DAW and digital video, editing systems,

audio signal routing in a typical DAW (e.g ProTools), plug-ins seen on DAW (ProTools or equivalent), synchronization of DAWs with other digital devices, applications of timecode, word clock and black burst.

Module 8 (10 *marks)*

Surround Sound

Surround sound systems from the early days of cinema till now, the impact of surround sound on the way sound is perceived, surround sound systems on film formats and in digital cinema, layout of surround sound loudspeakers in commercial theatres and home theatres, encoding and decoding surround sound, bass management in surround sound systems, conversion from surround to stereo format, compatibility of surround sound in stereo sound reproduction systems, loudspeaker placement for surround monitoring, Surround sound in home theatre systems, television and OTT platforms, Dolby Atmos & Auro 3D, comparison of Dolby Atmos with other surround sound formats, frequency response of surround sound loudspeakers, importance of LFE monitors in surround sound, sound level calibration for surround sound monitoring in theatres.

Surround Sound Microphones- SoundField Microphones, Holophone Microphone System, Atmos 5.1 Surround Microphone System.

Module 9 (*5 marks)*

Sound for Television

a) ***Different Television Systems followed worldwide***

PAL, SECAM, NTSC- how the three television systems work, comparison of frame rates for film and television, description of a frame on celluloid film and in video format (analogue & digital), transmission and reception of analogue television signals.

b) ***Sound Recording in Television***

Single system and double system recording for television, synchronization of sound and video in double system recording, different video tape formats (both analogue & digtal) , how sound is recorded on video tape and in tapeless systems (modern digital cameras), working of a telecine machine.

c) ***Digital Television Production & Transmission****:* How digital television transmission works, sound recording for a multi-camera production, sound recording for live transmissions, maintaining synchronization between multiple cameras and sound.

Module 10 (*5 marks)*

The Human Hearing System

Different parts of the human ear, comparison of the ear with the working of a microphone, range of sound levels that the human ear can safely tolerate, threshold of hearing and threshold of pain, audible range of frequencies, how the human ear responds to sound of different frequencies, Head Related Transfer Function (HRTF), interpretation of acoustic sound waves by the brain.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.