INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

ELECTRONICS AND COMMUNICATION ENGINEERING

DEFINITIONS AND TERMINOLOGY QUESTION BANK

Course Name	:	**ANALOG COMMUNICATIONS**
Course Code	:	**AECB12**
Program	:	**B.Tech**
Semester	:	**IV**
Branch	:	**Electronics and Communication Engineering**
Section	:	**A,B,C,D**
Academic Year	:	**2019– 2020**
Course Faculty	:	**Ms. Ajitha G, Assistant Professor,** **Dr. P.Munaswamy, Professor ,** **Mr. G.Kiran Kumar, Assistant Professor,** **Ms. P.Saritha , Assistant Professor.**

OBJECTIVES:

I	Introduce the communication system and need of modulation.
II	Understand the concepts of Amplitude Modulation and its types (DSB-SC, SSB and VSB).
III	Understand the concepts of Angular Modulation, FM and types of FM.
IV	Describe the behavior of analog communications in the presence of noise and also the basics of analog pulse modulation techniques.
V	Classify and discuss the different types of transmitters and receivers.

DEFINITIONS AND TERMINOLOGY QUESTION BANK

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
MODULE-I						
1	Define baseband signal.	Baseband signal in communication systems, the information-carrying signal that is modulated onto a carrier for transmission	Remember	CO1	CLO 1	AECB12.1
2	Define carrier signal.	The RF signal in a communications system that has the modulating signal superimposed on it. This signal may have its frequency , amplitude, or phase varied to form a modulated signal. Without modulation it is a simple RF signal.	Understand	CO1	CLO 1	AECB12.1
3	Define modulation property.	A property of the Fourier transform in which the Fourier transform of a modulated signal $c(t)e^{jwot}$ is equal to C(w − wo), where C(w) is the	Understand	CO1	CLO 2	AECB12.2

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		Fourier transform of c(t).				
4	Define Pilot carrier.	Pilot carrier is a small carrier transmitted with modulated signal from the transmitter. It is separated at the receiver and used to phase lock the locally generated carrier signal generated at the receiver. It provides synchronization at the receiver	Understand	CO1	CLO 1	AECB12.1
5	Define transmission efficiency of AM wave.	The transmission efficiency (η) of AM wave is defined as the percentage of total power contributed by side bands of the AM signal. The maximum transmission efficiency of an AM signal is 33.33%, i.e., only one third of the total transmitted power is carried by the side bands in an AM wave. The remaining two third of the total transmitted power gets wasted.	Remember	CO1	CLO 2	AECB12.2
6	Define Frequency division multiple access	Frequency division multiple access (FDMA) a multiple-access technique based on assigning each user a unique frequency band upon which transmission takes place.	Understand	CO1	CLO 1	AECB12.1
7	What is Balanced modulator?	Balanced modulator a modulator in which the carrier and modulating signal are introduced so that the output contains the two sidebands without the carrier.	Understand	CO1	CLO 2	AECB12.2
8	Define Local oscillator.	local oscillator an oscillator or circuit that produces a periodic signal whose function is to be utilized in the demodulation of a received radio signal. This periodic signal is typically a sinusoid and the oscillator is typically located in a radio receiver	Remember	CO1	CLO 2	AECB12.2
9	Define Ring Modulator.	Ring modulator is a product modulator used for DSB SC generation. It consists of four diodes connected in the form of ring. In AM , the ring modulator acts as a product modulator for a square wave carrier and modulating signal and generated a Double Side Band-Suppressed Carrier signal.	Understand	CO1	CLO 3	AECB12.3
10	Define envelope detector.	Envelope detector the optimum structure for detecting a modulated sinusoid with random phase in the presence of additive white Gaussian noise.	Understand	CO1	CLO 2	AECB12.2

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
11	Define Costas loop.	Costas loop a carrier synchronization loop in a digital communications receiver that uses a quadrature phase detector in place of a conventional square-law device.	Remember	CO1	CLO 3	AECB12.3
12	Define Diagonal clipping.	Diagonal clipping distortion that occurs in an AM demodulator (usually associated with diode detection), where the capacitor discharge time constant is set too long for the detector to accurately follow fast changes in the AM signal envelope.	Remember	CO1	CLO 2	AECB12.2
13	Define modulated signal.	The resultant signal after the process of modulation is called as a modulated signal.	Remember	CO1	CLO 1	AECB12.1
14	What is over modulation?	Over modulation is the condition that prevails in telecommunication when the instantaneous level of the modulating signal exceeds the value necessary to produce 100% modulation of the carrier	Understand	CO1	CLO 2	AECB12.2
15	Define modulation index of AM.	Modulation index of AM is defined as the ratio of message signal amplitude to the carrier signal amplitude.	Understand	CO1	CLO 2	AECB12.2
16	What is need for modulation?	Baseband signals are incompatible for direct transmission. For such a signal, to travel longer distances, its strength has to be increased by modulation	Understand	CO1	CLO 2	AECB12.2
17	Define Pilot carrier.	Pilot carrier is a small carrier transmitted with modulated signal from the transmitter. It is separated at the receiver and used to phase lock the locally generated carrier signal generated at the receiver. It provides synchronization at the receiver	Remember	CO1	CLO 2	AECB12.2
18	What is multi tone modulation?	message signals (which has more than one frequency component)is called multi tone modulation.	Understand	CO1	CLO 1	AECB12.1
19	What is the time domain description of DSBSC?	$m(t) = A_m\cos(2\pi f_m t)$ $c(t) = A_c\cos(2\pi f_c t)$ $s(t) = m(t).c(t)$	Understand	CO1	CLO 2	AEC005.2
20	What is Balanced modulator?	Balanced modulator a modulator in which the carrier and modulating signal are introduced so that the output contains the two sidebands without the carrier.	Remember	CO1	CLO 3	AECB12.3
21	Define Local oscillator.	Local oscillator an oscillator or circuit that produces a periodic signal whose function is to be utilized in the	Remember	CO1	CLO 3	AECB12.3

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		demodulation of a received radio signal.				
22	Define low level modulation.	Low level modulation is the modulation in which modulation is done at low power level.	Understand	CO1	CLO 2	AECB12.2
23	Define carrier signal.	The RF signal in a communications system that has the modulating signal superimposed on it.	Remember	CO1	CLO 2	AECB12.2
24	What is Transmission efficiency?	Transmission efficiency defined as the percentage of total power contributed by side bands.	Understand	CO1	CLO 2	AECB12.2
25	What is multi tone AM?	Transmission of Multi tones (more than one modulating signals)at a time.	Understand	CO1	CLO 1	AECB12.1
26	What is DSBFC?	DSBFC is the modulation in which sidebands are transmitted along with full carrier wave.	Understand	CO1	CLO 1	AECB12.1
27	Define Spectrum of DSBSC wave.	The spectrum of DSBSC wave contains upper side band ,lower sideband.	Understand	CO1	CLO 2	AECB12.2
28	Define bandwidth DSBSC wave.	Band width of AM wave is defined as the difference between upper side band frequency and lower side band frequency. Bandwidth = 2fm.	Remember	CO1	CLO 1	AECB12.1
29	Define average power of carrier signal.	The average power of carrier signal is Ac^2 /2R.where Ac is the amplitude of the carrier.	Remember	CO1	CLO 2	AECB12.2
30	Define transmission efficiency of DSBSC wave.	The maximum transmission efficiency of an DSBSC signal is 100%	Understand	CO1	CLO 1	AECB12.1
31	Define Ring Modulator.	Ring modulator is a product modulator used for DSB SC generation. It consists of four diodes connected in the form of ring. In AM , the ring modulator acts as a product modulator for a square wave carrier and modulating signal and generated a Double Side Band-Suppressed Carrier signal.	Understand	CO1	CLO 2	AECB12.2
32	Define envelope detector.	Envelope detector the optimum structure for detecting a modulated sinusoid with random phase in the presence of additive white Gaussian noise.	Remember	CO1	CLO 2	AECB12.2
33	Define Demodulation.	Recovery of message signal from modulated wave is called demodulation	Understand	CO1	CLO 2	AECB12.2

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
34	What is Amplitude modulation?	Amplitude modulation may be defined as maximum amplitude of carrier wave is varied in accordance with the message signal amplitude.	Remember	CO1	CLO 2	AECB12.2
35	What is band width of AM wave?	Band width of AM wave is defined as the difference between upper side band frequency and lower side band frequency. Bandwidth = 2fm	Remember	CO1	CLO 2	AECB12.2
36	What is CW modulation?	A high frequency sine wave is used as a carrier wave then it is called cw modulation	Understand	CO1	CLO 2	AECB12.2
37	Define Diagonal clipping.	Diagonal clipping distortion that occurs in an AM demodulator (usually associated with diode detection), where the capacitor discharge time constant is set too long for the detector to accurately follow fast changes in the AM signal envelope	Remember	CO1	CLO 2	AECB12.2
38	What is the time domain description of AM?	$m(t)=A_m\cos(2\pi f_m t)$ $c(t)=A_c\cos(2\pi f_c t)$ $s(t)=[A_c+A_m\cos(2\pi f_m t)]\cos(2\pi f_c t)$	Understand	CO1	CLO 2	AECB12.2
39	Define perfect modulation.	The modulation index is equal to1, then the modulation is called as perfect- modulation	Remember	CO1	CLO 2	AECB12.2
40	What is communication system?	Communication system is used to transfer the message signal from transmitter to receiver.	Remember	CO1	CLO 1	AECB12.2
41	Define high level modulation.	High level modulation is the modulation in which modulation is done at high power level.	Remember	CO1	CLO 2	AECB12.2
MODULE -II						
1	Define generation methods of SSB-SC.	Frequency discrimination and phase discrimination methods are used to generate SSB-SC signal.	Remember	CO 2	CLO 4	AECB12.4
2	Define frequency mixer.	A device that performs the frequency translation of a modulated signal.	Understand	CO 2	CLO 4	AECB12.4
3	What is the application of VSB modulation?	VSB modulation is used in television applications.	Remember	CO 2	CLO 5	AECB12.5
4	What is frequency translation?	Frequency translation the process of transferring a signal form one part of the frequency axis to the other is called Frequency translation. It occurs frequently in a Wireless communication system, that is, Frequency translation is used to transfer the pass band signal to base	Understand	CO 2	CLO 4	AECB12.4

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		band signal.				
5	Define carrier suppression.	Carrier suppression is generally used as a method to significantly reduce the amount of unnecessary transmitted power, based upon the fact that no information is contained within the carrier amplitude in an AM waveform	Remember	CO 2	CLO 4	AECB12.4
6	Define VSB modulation.	In VSB 1. One sideband is not rejected fully. 2. One sideband is transmitted fully and a small part (vestige) of the other sideband is transmitted	Understand	CO 2	CLO 5	AECB12.5
7	Define figure of merit.	The ratio of the input power to the output power. It is a figure of merit for the energy cost effectiveness of a device.	Remember	CO 2	CLO 4	AECB12.4
8	Define Signal-to-noise ratio.	Signal-to-noise ratio (SNR) the ratio of the average power of the information signal component to the average power of the noise component in a signal consisting of the sum of an information signal component and a corrupting noise component. It is a unit less quantity.	Understand	CO 2	CLO 4	AECB12.4
9	Define Bandwidth of SSBSC.	The bandwidth of SSBSC is highest modulating frequency.	Understand	CO 2	CLO 4	AECB12.4
10	Define noise.	An unwanted signal that propagates along with the required signal.	Understand	CO 2	CLO 4	AECB1204
11	Define VSB modulation.	In VSB One sideband is not rejected fully. 2. One sideband is transmitted fully and a small part (vestige) of the other sideband is transmitted	Understand	CO 2	CLO 5	AECB12.04
12	Define figure of merit.	The ratio of the input power to the output power. It is a figure of merit for the energy cost effectiveness of a device.	Remember	CO 2	CLO 5	AECB12.04
13	Define SSBSC.	SSBSC is modulation technique to provide single side band with suppressed carrier.	Understand	CO 2	CLO 4	AECB12.04
14	Define coherent detection.	In coherent detection locally generated carrier is exactly coherent or synchronized in both frequency and phase with the original carrier wave c(t) which is used to generate the DSB-SC wave or SSB-SC wave.	Understand	CO 2	CLO 4	AECB12.04

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
15	Define frequency discrimination method.	In frequency discrimination method DSBSC signal is filtered by band pass filter.	Remember	CO 2	CLO 4	AECB12.04
16	Define detection of SSBSC with having large carrier.	Envelope detector is used for detection of SSBSC with having large carrier	Remember	CO 2	CLO 4	AECB12.04
17	Define frequency spectrum of VSBSC.	The spectrum of VSBSC contains upper side band and part of the lower side band.	Understand	CO 2	CLO 5	AECB12.05
18	What is equation of VSBSC frequency spectrum?	Equation of VSBSC frequency spectrum $S(f)=Ac/2[M(f-fc)+M(f+fc)]H(f)$	Understand	CO 2	CLO 5	AECB12.05
19	Define quadrature component of narrowband noise.	$nQ(t) \sin \omega_c t$ is the in-phase component	Understand	CO 2	CLO 5	AECB12.05
20	Define quadrature component of narrowband noise.	$nQ(t) \sin \omega_c t$ is the in-phase component	Understand	CO 2	CLO 4	AECB12.04
21	Define Output SNR.	It is the ratio Average power of demodulated signal s(t) to Average power of noise	Understand	CO 2	CLO 4	AECB12.04
22	Define Band pass filter.	An electronic circuits which allows the band of frequency signals	Remember	CO 2	CLO 4	AECB12.04
23	Define Input SNR.	It is ratio Average power of modulated signal s(t) Average power of noise	Understand	CO 2	CLO 6	AECB12.06
24	Define noise.	An unwanted signal that propagates along with the required signal.	Understand	CO 2	CLO 6	AECB12.06
25	What is frequency spectrum?	The frequency spectrum is a conversion of time domain signal to frequency domain (Distribution of the amplitudes and phases of each frequency component against frequency.)	Remember	CO 2	CLO 4	AECB12.04
26	What is frequency translation?	Frequency translation the process of transferring a signal form one part of the frequency axis to the other is called Frequency translation.	Understand	CO 2	CLO 5	AECB12.04
27	What is the total power in SSB-SC wave?	The power of SSBSC wave is Pt=PUSB=PLSB	Understand	CO 2	CLO 5	AECB12.04
28	What are the advantages of SSB?	Bandwidth or spectrum space occupied is lesser than AM and DSBSC waves. Transmission of more number of signals is allowed. Power is saved.High power signal can be transmitted.	Remember	CO 2	CLO 5	AECB12.04

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
29	Define time domain equation of SSBSC USB for single tone modulation.	s(t)=AmAc/2cos[2π(fc+fm)t]	Understand	CO 2	CLO 5	AECB12.04
30	Define power of message signal.	The power of the message signal=$A^2/2m$	Remember	CO 2	CLO 5	AECB12.04
31	Define Channel model .	Channel is Distortion less ,Additive White Gaussian Noise (AWGN)	Remember	CO 2	CLO 4	AECB12.04
32	Define Signal-to-noise ratio.	Signal-to-noise ratio (SNR) the ratio of the average power of the information signal component to the average power of the noise component in a signal consisting of the sum of an information signal component and a corrupting noise component. It is a unit less quantity.	Understand	CO 2	CLO 4	AECB12.04
33	Define Bandwidth of SSBSC.	The bandwidth of SSBSC is highest modulating frequency.	Understand	CO 2	CLO 4	AECB12.04
34	Define filter.	An electronic circuits which allows the wanted signals and rejects unwanted signals.	Understand	CO 2	CLO 6	AECB12.06
35	What is the application of VSB modulation?	VSB modulation is used in television applications.	Remember	CO 2	CLO 5	AECB12.05
36	What is the time domain description of SSBSC LSB?	$s(t)=m(t)\cos w_c t+m_h(t)\sin w_c t$ where $m_h(t)$ is the Hilbert transform of message signal	Understand	CO 2	CLO 5	AECB12.05
37	What are the disadvantages of SSB -SC?	The generation and detection of SSBSC wave is a complex process. The quality of the signal gets affected unless the SSB transmitter and receiver have excellent frequency stability.	Understand	CO 2	CLO 5	AECB12.05
38	What is Figure of merit of DSBSC receiver.	The Figure of merit of DSBSC receiver is 1.	Remember	CO 2	CLO 4	AECB12.04
39	Define Power Spectral Density of Noise.	Power Spectral Density of Noise $N_0/2$, and is defined for both positive and negative frequency	Understand	CO 2	CLO 5	AECB12.05
40	Define in-phase component of narrowband noise.	$n_I(t) \cos \omega_c t$ is the in-phase component	Remember	CO 2	CLO 5	AECB12.05
41	Define the deviation ratio D for non-sinusoidal modulation.	The deviation ratio D is defined as the ratio of the frequency deviation f, which Corresponds to the maximum possible amplitude of the modulation signal m (t), to the highest modulation frequency. $D = \Delta f / f_m$	Remember	CO 2	CLO 4	AECB12.04

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
MODULE –III						
1	Define phase modulation.	Phase modulation a type of angle modulation whereby information is encoded onto a carrier wave by modifying its phase angle as a function of time in proportion to the intelligence signal amplitude.	Understand	CO 3	CLO 7	AECB12.07
2	Define Foster-Seeley Discriminator.	The Foster-Seeley Discriminator is also known as the Phase-Shift Discriminator. It uses a double-tuned rf transformer to convert frequency variations in the received fm signal to amplitude variations. These amplitude variations are then rectified and filtered to provide a dc output voltage.	Remember	CO 3	CLO 9	AECB12.09
3	Define Ratio detector	The ratio detector is a variant of the Foster-Seeley discriminator, but one diode conducts in an opposite direction, and using a tertiary winding in the preceding transformer. The output in this case is taken between the sum of the diode voltages and the center tap.	Understand	CO 3	CLO 9	AECB12.09
4	Define Indirect method of FM generation.	Indirect method is the transmitter originates a wave whose phase is a function of the modulation. Normally it is used for the generation of WBFM. where WBFM is generated from NBFM	Understand	CO 3	CLO 9	AECB12.09
5	Define De-emphasis.	De-emphasis is by reducing the amplitude level of the received high frequency signal by the same amount as the increase in pre-emphasis is termed as De- emphasis.	Understand	CO 3	CLO 9	AECB12.09
6	Define Slope detector.	The slope detection is a method of FM-demodulation which converts the received FM signal to AM and demodulates with an envelope detector.	Understand	CO 3	CLO 9	AECB12.09
7	Define phase locked loop.	(i)Automatic frequency correction in FM transmitter uses PLL to keep carrier frequency constant. (ii)PLL is used direct FM Transmitter uses PLL to keep carrier frequency constant. (iii) PLL is also used in FM demodulators	Remember	CO 3	CLO 9	AECB12.09
8	Define Amplitude Limiting.	Amplitude limiting is “a process in which the amplitude of output signal is limited to a desired level or margin	Remember	CO 3	CLO 8	AECB12.08

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		irrespective of the variations in the input signal				
9	Define zero crossing detector.	A zero crossing detector or ZCD is a one type of voltage comparator, used to detect a sine waveform transition from positive and negative, that coincides when the i/p crosses the zero voltage condition	Understand	CO 3	CLO 9	AECB12.09
10	Define average power of FM signal.	The amplitude of the frequency modulated signal is constant .The power of the FM signal is same as that of the carrier power.	Understand	CO 3	CLO 7	AECB12.07
11	Define modulation index of FM.	Modulation index of FM is defined as the ratio of frequency deviation to the modulating frequency.	Remember	CO 3	CLO 7	AECB12.07
12	What is Frequency modulation?	Frequency modulation is a process in which the frequency of the carrier is controlled by the modulating signal.	Understand	CO 3	CLO 7	AECB12.07
13	What is carsons rule?	This rule states that the bandwidth of an FM system is double the sum of the maximum frequency deviation and the highest modulating frequency.	Understand	CO 3	CLO 7	AECB12.07
14	Define Pre emphasis.	The artificial boosting of higher modulating frequencies is called as Pre emphasis. Pre-emphasis is done at the transmitter.	Understand	CO 3	CLO 9	AECB12.09
15	Define spectrum of wide band FM.	The spectrum of wide band FM consists of infinity sidebands	Remember	CO 3	CLO 8	AECB12.08
16	Define mathematical expression for PM.	$s(t)=A\cos(2\pi fct+kpm(t)$	Remember	CO 3	CLO 7	AECB12.07
17	Define phase detector.	A phase detector or phase comparator is a frequency mixer, analog multiplier or logic circuit that generates a voltage signal which represents the difference in phase between two signal inputs	Understand	CO 3	CLO 9	AECB12.09
18	Define Capture range.	Capture range is the frequency range in which the PLL acquires phase lock.	Understand	CO 3	CLO 4	AECB12.08
19	Define Indirect method of FM generation.	Indirect method is the transmitter originates a wave whose phase is a function of the modulation. Normally it is used for the generation of WBFM where WBFM is generated from NBFM	Remember	CO 3	CLO 8	AECB12.08
20	Define Slope detector.	The slope detection is a method of FM-demodulation which converts the received FM signal to AM and demodulates with an envelope detector.	Remember	CO 3	CLO 9	AECB12.09

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
21	What is direct method to generate FM wave?	In Direct method the base band signal directly modulates the carrier.	Understand	CO 3	CLO 8	AECB12.08
22	What is frequency synthesizer?	Frequency synthesizer is a circuit that can produce a large number of output frequencies from a small number of fixed frequency oscillators.	Understand	CO 3	CLO 9	AECB12.09
23	Define wide band FM.	For large values of modulation index mf , the FM wave ideally contains the carrier and an infinite number of sidebands located symmetrically around the carrier. Such a FM wave has infinite bandwidth and hence called as wideband FM. The modulation index of wideband FM is higher than 1	Understand	CO 3	CLO 8	AECB12.08
24	Define mathematical expression for FM.	Vcsin(wct+mfsinwmt) Where mf is the modulation index of FM wave	Remember	CO 3	CLO 7	AECB12.07
25	Define Figure of merit of FM.	Figure of merit of FM is $3/2\beta^2$ where β is modulation index	Remember	CO 3	CLO 7	AECB12.07
26	Define voltage-controlled oscillator (VCO)	voltage-controlled oscillator (VCO) is an electronic device whose output is controlled by input voltage.	Understand	CO 3	CLO 8	AECB12.08
27	What is diversity reception?	Diversity reception is used when the signal fades into noise level.	Understand	CO 3	CLO 8	AECB12.08
28	What are properties of Bessel function?	$J_n(\beta) = (-1)^n J_{-n}\beta$ for all n, both positive and negative. (ii) For small values of the modulation index β , we have $J_0(\beta) = 1$	Understand	CO 3	CLO 7	AECB12.07
29	Define zero crossing detector.	A zero crossing detector or ZCD is a one type of voltage comparator, used to detect a sine waveform transition from positive and negative, that coincides when the i/p crosses the zero voltage condition	Remember	CO 3	CLO 9	AECB12.09
30	Define average power of FM signal.	The amplitude of the frequency modulated signal is constant .The power of the FM signal is same as that of the carrier power.	Remember	CO 3	CLO 7	AECB12.07
31	Define modulation index of FM.	Modulation index of FM is defined as the ratio of frequency deviation to the modulating frequency.	Understand	CO 3	CLO 7	AECB12.07
32	What is Frequency modulation?	Frequency modulation is a process in which the frequency of the carrier is controlled by the modulating signal.	Understand	CO 3	CLO 7	AECB12.07
33	What is single tone FM wave?	FM wave the message signal contains only one frequency.	Remember	CO 3	CLO 7	AECB12.07

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
34	Define narrow band FM.	A narrow band FM is the FM wave with a small bandwidth .The modulation index mf of narrow band FM is small.	Remember	CO 3	CLO 7	AECB12.07
35	Define mathematical equation of FM wave.	$s(t)=A\cos(2\pi fct+2\pi kf\int m(t)dt)$	Understand	CO 3	CLO 8	AECB12.08
36	Define lock range.	The lock range is defined as the range of frequencies over which the PLL system follows the changes in the input frequency fIN	Understand	CO 3	CLO 8	AECB12.08
37	Define direct method of FM generation.	Direct method the transmitter originates a wave whose frequency varies as function of the modulating source.	Remember	CO 3	CLO 8	AECB12.08
38	Define phase locked loop.	(i)Automatic frequency correction in FM transmitter uses PLL to keep carrier frequency constant. (ii)PLL is used direct FM Transmitter uses PLL to keep carrier frequency constant. (iii) PLL is also used in FM demodulators	Remember	CO 3	CLO 8	AECB12.08
39	Define Amplitude Limiting.	Amplitude limiting is "a process in which the amplitude of output signal is limited to a desired level or margin irrespective of the variations in the input signal	Understand	CO 3	CLO 7	AECB12.07
40	Define lock range.	The lock range is defined as the range of frequencies over which the PLL system follows the changes in the input frequency fIN	Understand	CO 3	CLO 8	AECB12.08
MODULE -IV						
1	Define noise	Noise is defined as any unwanted form of energy, which tends to interfere with wanted signal.	Understand	CO 4	CLO 7	AECB12.07
2	Give the classification of noise.	Noise is broadly classified into two types. They are (i)External noise (ii)Internal noise	Remember	CO 4	CLO 7	AECB12.07
3	Define the sources of internal noise.	Internal noise is created by the active and passive components present within the communication circuit can be includes 1. Thermal noise 2. Shot noise 3. Transit time noise 4. Miscellaneous internal noise	Remember	CO 4	CLO 7	AECB12.07
4	Define the sources of External noise.	External noise is created outside the circuit and includes 1.Atmospheric noise 2. Extraterrestrial noises	Understand	CO 4	CLO 8	AECB12.08

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		3.Man–made noises or industrial noises				
5	Define shot noise.	Shot noise appers in active devices due to random behavior of charge carriers.In semiconductors it is due to random diffusion of minority carriers.	Understand	CO 4	CLO 7	AECB12.07
6	Define resistor noise.	The noise arising due to random motion of free charged particle in a conducting media such as a resistor.	Remember	CO 4	CLO 7	AECB12.07
7	Define flicker noise.	Flicker noise is the imperfections in surfaces around the junctions of semiconductor devices i.e transistors operating at low audio frequencies.	Understand	CO 4	CLO 10	AECB12.10
8	Define Power Density spectrum of resistor noise.	Resistor noise to be Gaussian distributed with zero mean $S_i(\omega)=\frac{2KTG}{1+\left(\frac{\omega}{\alpha}\right)2}$ T=Temperature, G=conductance of resistor, K=Boltzmann constant, α=no of collisions per second.	Understand	CO 4	CLO 10	AECB12.10
9	Define white noise and its power desity spectrum.	White noise contains all the frequencies.The power spectral density of white noise is constant for all frequencies. Si(ω)=No/2	Remember	CO 4	CLO 10	AECB12.10
10	Define narrow band noise	Random process X(t) is bandpass or **narrowband** random process if its power spectral density SX(f) is nonzero only in a small neighborhood of some high frequency fc	Understand	CO 4	CLO 10	AECB12.10
11	Define In phase component of narrow band noise.	$n_I(t)\cos\omega_c t$ is In phase component	Remember	CO 4	CLO 10	AECB12.10
12	Define Properties of narrow band noise.	1.Narrow-band noise is represented as in terms of its envelope and phase. 2.Narrow-band Gaussian noise is used as a noise model in communication system. 3.The assumption of Gaussian and WSS (wide-sense- stationary) behavior are easy to understand.	Understand	CO 4	CLO 10	AECB12.10
13	Define quadrature component of narrowband noise.	$n_Q(t)\sin\omega_c t$ is quadrature component	Remember	CO 4	CLO 11	AECB12.11
14	Define Average Noise Bandwidth	The noise bandwidth B_n is defined as the bandwidth of the ideal filter that would pass the same signal power as the real filter when each is driven by stationary random noise.	Remember	CO 4	CLO 11	AECB12.11

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
15	Define Effective Noise Temperature	Effective input noise temperature is the source noise temperature in a two-port network or amplifier that will result in the same output noise power, when connected to a noise-free network or amplifier	Remember	CO 4	CLO 11	AECB12.11
16	Define Average Noise Figures	The noise figure is the difference in decibels (dB) between the noise output of the actual receiver to the noise output of an "ideal" receiver with the same overall gain and bandwidth when the receivers are connected to matched sources at the standard noise temperature T0	Understand	CO 4	CLO 10	AECB12.10
17	Define Average Noise Figure of cascaded networks	Noise figure (NF) is the increase in noise power of a device from the input to the output that is greater than the signal gain. In effect, it is the amount of decrease of the signal-to-noise ratio. If only loss exists in the cascade, then the cascaded noise figure equals the magnitude of the total loss.	Understand	CO 4	CLO 10	AECB12.10
18	Define Pre-emphasis	Pre-emphasis refers to boosting the relative amplitudes of the modulating voltage for higher audio frequencies from 2 to approximately 15 KHz.	Remember	CO 4	CLO 10	AECB12.10
19	Define de-emphasis	Reducing the amplitude level of the received high frequency signal by the same amount as the increase in pre-emphasis is termed as De-emphasis	Understand	CO 4	CLO 10	AECB12.10
20	Define figure of merit.	The ratio of the input power to the output power. It is a figure of merit for the energy cost effectiveness of a device.	Remember	CO 4	CLO 10	AECB12.10
21	Define Signal-to-noise ratio.	Signal-to-noise ratio (SNR) the ratio of the average power of the information signal component to the average power of the noise component in a signal consisting of the sum of an information signal component and a corrupting noise component. It is a unit less quantity.	Understand	CO 4	CLO 10	AECB12.10
22	Define quadrature component of narrowband noise.	$n_Q(t) \sin \omega_c t$ is the in-phase component	Remember	CO 4	CLO 10	AECB12.10
23	Define Output SNR.	It is the ratio Average power of demodulated signal s(t) to Average	Understand	CO 4	CLO 10	AECB12.10

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		power of noise				
24	What is information?	Information can be defined as the inverse of probability of occurrence = - log pk	Remember	CO 4	CLO 10	AECB12.10
25	Define FM noise triangle.	Noise has more effect on higher frequencies in FM. The triangular distribution of noise in FM is called as FM noise triangle.	Remember	CO 4	CLO 11	AECB12.11
26	Define , the Figure of merit of DSBSC	The Figure of merit of DSBSC receiver is 1.	Remember	CO 4	CLO 10	AECB12.10
27	Define , the Figure of merit of SSBSC	The Figure of merit of SSBSC receiver is 1.	Understand	CO 4	CLO10	AECB12.10
28	Define , the Figure of merit of AM	The Figure of merit of AM is $\mu^2/2+ \mu^2$ where μis modulation index.	Remember	CO 4	CLO 10	AECB12.10
29	Define Output SNR.	It is the ratio Average power of demodulated signal s(t) to Average power of noise	Understand	CO 4	CLO10	AECB12.10
30	Define the average power of the DSB-SC modulated signal	The average power of the DSB-SC modulated signal is $CA_c^2P/2$	Remember	CO 4	CLO 12	AECB12.12
31	Define the average noise power at the receiver	The average noise power at the receiver is $WN_o/2$	Understand	CO 4	AECB12 .12	AECB12.12
32	Define the output signal-to-noise ratio of an AM using an envelope detector	The output signal-to-noise ratio of an AM using an envelope detector is $A_c^2k_a^2P/2WN_o$	Remember	CO 4	AECB12 .12	AECB12.12
33	Define figure of merit for 100 percent modulation	When μ= 1 (100% modulation using envelope detection), figure of merit = 1/3.	Remember	CO 4	AECB12 .10	AECB12.10
34	Define limiter	The limiter is used to remove amplitude variations by clipping the modulated wave at the filter output almost to the zero axis.	Understand	CO 4	CLO 10	AECB12.10
35	Define the post-detection filter	The post-detection filter, labeled “baseband low-pass filter,” has a bandwidth that is just large enough to accommodate the highest fl	Understand	CO 4	CLO 10	AECB12.10
36	Define the average output signal power.	The average output signal power is equal to kf^2P, where Pi s the average power o f the message signal m(t).	Remember	CO 4	CLO 10	AECB12.10
37	Define Figure of merit for	Figure of merit for frequency modulation is $3K_f^2P/W^2$	Understand	CO 4	CLO 10	AECB12.10

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
	frequency modulation					
38	Define Average Noise Bandwidth	The noise bandwidth B_n is defined as the bandwidth of the ideal filter that would pass the same signal power as the real filter when each is driven by stationary random noise.	Remember	CO 4	CLO 10	AECB12.10
39	Define Effective Noise Temperature	Effective input noise temperature is the source noise temperature in a two-port network or amplifier that will result in the same output noise power, when connected to a noise-free network or amplifier	Understand	CO 4	CLO 10	AECB12.10
40	Define narrow band noise	Random process X(t) is bandpass or **narrowband** random process if its power spectral density SX(f) is nonzero only in a small neighborhood of some high frequency fc	Remember	CO 4	CLO 12	AECB12.12
		UNIT-V				
1	Define super heterodyne receiver.	A super heterodyne receiver, often shortened to superhet, is a type of radio receiver that uses frequency mixing to convert a received signal to a fixed Intermediate frequency (IF) which can be more conveniently processed than the original carrier frequency.	Understand	CO 5	CLO 12	AECB12.12
2	Define tuned radio frequency receiver.	A tuned radio frequency receiver (or TRF receiver) is a type of radio receiver that is composed of one or more tuned radio frequency (RF) amplifier stages followed by a detector (demodulator) circuit to extract the audio signal and usually an audio frequency amplifier.	Remember	CO 5	CLO 12	AECB12.12
3	Define Pulse Modulation.	Pulse Modulation is a form of signal modulation where the message information is encoded in the amplitude of a series of signal pulses.	Remember	CO 5	CLO 14	AECB12.14
4	What is PAM?.	By varying the Amplitude of the pulses (the carrier signal) in proportion to the instantaneous values of the analog signal (the message signal).	Remember	CO 5	CLO 14	AECB12.14
5	What is PPM?	By varying the position of the pulses (the carrier signal) in proportion to the instantaneous values of the analog signal (the	Remember	CO 5	CLO 14	AECB12.14

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		message signal)				
6	What is PWM?	By varying the width of the pulses (the carrier signal) in proportion to the instantaneous values of the analog signal (the message signal).	Remember	CO 5	CLO 14	AECB12.14
7	What is Analog Modulation?	Analog modulation refers to the process of transferring an analog baseband (low frequency) signal, like an audio or TV signal over a higher frequency signal such as a radio frequency band.	Understand	CO 5	CLO 14	AECB12.14
8	Define Fidelity.	Fidelity of a receiver is its ability to reproduce the exact replica of the transmitted signals at the receiver output.	Remember	CO 5	CLO 13	AECB12.13
9	Define Double spotting.	Double spotting is a condition where the same desired signal is detected at two nearby points on the receiver tuning dial.	Remember	CO 5	CLO 13	AECB12.13
10	Define Filter.	It removes the unwanted components in original data.	Understand	CO 5	CLO 12	AECB12.12
11	Define selectivity.	Selectivity is the ability of receiver for selecting a particular signal, while rejecting the others	Understand	CO 5	CLO 13	AECB12.13
12	Define automatic gain control.	Automatic gain control (AGC), also called automatic volume control (AVC), is a closed-loop feedback regulating circuit in an amplifier or chain of amplifiers, the purpose of which is to maintain a suitable signal amplitude at its output, despite variation of the signal amplitude at the input.	Remember	CO 5	CLO 13	AECB12.13
13	Define beat frequency oscillator.	In a radio receiver, a beat frequency oscillator or BFO is a dedicated oscillator used to create an audio frequency signal from Morse code radiotelegraphy (CW) transmissions to make them audible.	Understand	CO 5	CLO 13	AECB12.13
14	Define receiver.	Receiver is a device to extract the information signal from the modulated signal by the operation of demodulation.	Remember	CO 5	CLO13	AECB12.13
15	What is mixer?	Mixer is a non linear circuit to generate sum and difference frequencies when two or more frequencies are present at its inputs.	Understand	CO 5	CLO 13	AECB12.13
16	Define amplitude	Amplitude limiting is “a process in which the amplitude of output	Understand	CO 5	CLO 14	AECB12.14

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
	limiting.	signal is limited to a desired level or margin irrespective of the variations in the input signal"				
17	What is Transmission B.W?	Transmission bandwidth is the actual width of the transmitted signal	Remember	CO 5	CLO 14	AECB12.14
18	What is sensitivity of receiver?	Sensitivity is the capacity of receiver for detecting RF signal and demodulating it, while at the lowest power level.	Remember	CO 5	CLO 13	AECB12.13
19	Define image frequency.	It is an undesired input frequency equal to the station frequency plus (or minus) twice the intermediate frequency	Understand	CO 5	CLO 13	AECB12.13
20	What is Channel?	Definition of communication channel: A medium through which a message is transmitted to its intended audience, such as print media or broadcast	Remember	CO 5	CLO 14	AECB12.14
21	Define Band Width?	Bandwidth is defined as a range within a band of frequencies or wavelengths.	Understand	CO 5	CLO 14	AECB12.14
22	What is intermediate-frequency amplifier?	A variable local oscillator is used in the receiver to hold the difference-signal center frequency constant as the receiver is tuned. The constant frequency of the down converted signal is called the intermediate frequency (IF), and it is this signal that is processed by the intermediate-frequency amplifier.	Remember	CO 5	CLO 13	AECB12.13
23	What is Intermediate frequency filter?	Intermediate frequency filter is a band pass filter, which passes the desired frequency	Understand	CO 5	CLO 13	AECB12.13
24	Define image frequency rejection ratio.	The image rejection ratio, or image frequency rejection ratio, is the ratio of the intermediate-frequency (IF) signal level produced by the desired input frequency to that produced by the image frequency. The image rejection ratio is usually expressed in dB.	Remember	CO 5	CLO 13	AECB12.13
25	Define automatic frequency control.	Automatic Frequency Control (AFC), also called Automatic Fine Tuning (AFT), is a method or circuit to automatically keep a resonant circuit tuned to the frequency of an incoming radio signal.	Remember	CO 5	CLO 13	AECB12.13
26	What is	is an electronic amplifier that reproduces low-power electronic	Remember	CO 5	CLO 13	AECB12.13

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
	Radio frequency amplifier?	audio signals such as the signal from radio receiver or electric guitar pickup at a level that is strong enough for driving (or powering) loudspeakers or headphones.				
27	What is heterodyning?	A heterodyne is a circuit that transfers a signal from one carrier wave to another with a different frequency.	Understand	CO 5	CLO 12	AECB12.12
28	What is gain?	The gain of a voltage amplifier is the ratio of the output voltage to the input voltage.	Remember	CO 5	CLO 13	AECB12.13
29	What is closed loop feedback?	A Closed-loop Control System, also known as a feedback control system is a control system which uses the concept of an open loop system as its forward path but has one or more feedback loops(hence its name) or paths between its output and its input.	Remember	CO 5	CLO 13	AECB12.13
30	What is tuned circuit?	Tuned circuit, any electrically conducting pathway containing both inductive and capacitive elements.	Understand	CO 5	CLO 12	AECB12.12
31	Define Double Polarity In PAM .	Double polarity PAM is a situation where the pulses are both positive and negative.	Understand	CO 5	CLO 14	AECB12.14
32	What is band limited signal.	Band limiting is the limiting of a signal's frequency domain representation or spectral density to zero above a certain finite frequency	Remember	CO 5	CLO 14	AECB12.14
33	What is oscillator?	An oscillator is a mechanical or electronic device that works on the principles of oscillation: a periodic fluctuation between two things based on changes in energy	Remember	CO 5	CLO 12	AECB12.12
34	Define Single Polarity In PAM.	Single polarity PAM is a situation where a suitable fixed DC bias is added to the signal to ensure that all the pulses are positive.	Understand	CO 5	CLO 14	AECB12.14
35	Define Double Polarity In PAM .	Double polarity PAM is a situation where the pulses are both positive and negative.	Understand	CO 5	CLO 12	AECB12.12
36	Define intermediate frequency.	Intermediate frequency (IF) is a frequency to which a carrier wave is shifted as an intermediate step in transmission or reception	Understand	CO 5	CLO 13	AECB12.13
37	What is audio frequency?	a frequency of oscillation capable of being perceived by the human ear, generally between 20 and 20,000 Hz.	Remember	CO 5	CLO 13	AECB12.13
38	What is radio frequency?	Radio frequency (RF) is a measurement representing the	Understand	CO 5	CLO 13	AECB12.13

S.No	QUESTION	ANSWER	Blooms Level	Course Outcome	CLO	CLO Code
		oscillation rate of electromagnetic radiation spectrum, or electromagnetic radio waves, from frequencies ranging from 300 GHz to as low as 9 kHz.				
39	Define image rejection ratio.	The image rejection ratio, or image frequency rejection ratio, is the ratio of the intermediate-frequency (IF) signal level produced by the desired input frequency to that produced by the image frequency. The image rejection ratio is usually expressed in dB.	Remember	CO 5	CLO 13	AECB12.13
40	What is band limited signal?	A band pass signal is a signal containing a band of frequencies not adjacent to zero frequency, such as a signal that comes out of a band pass filter.	Understand	CO 5	CLO 14	AECB12.14

Signature of the Faculty **Signature of HOD**