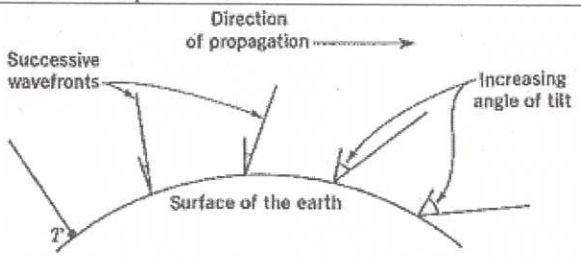
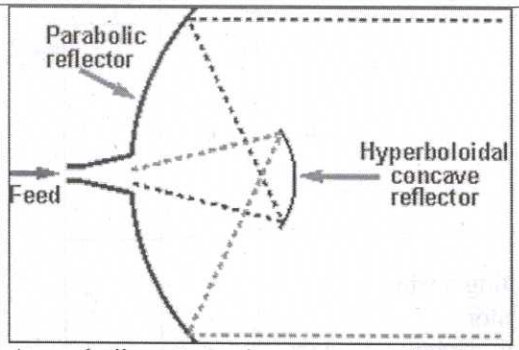
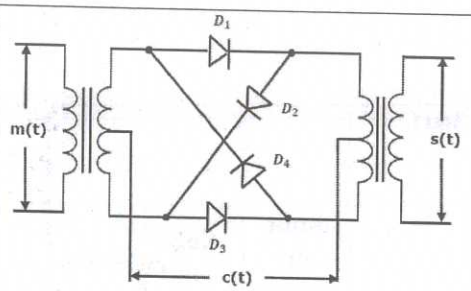
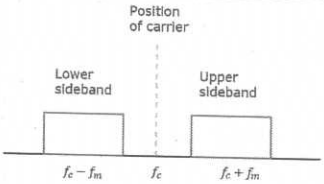
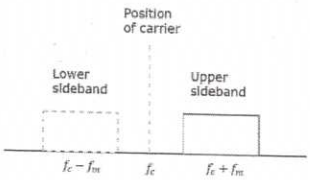
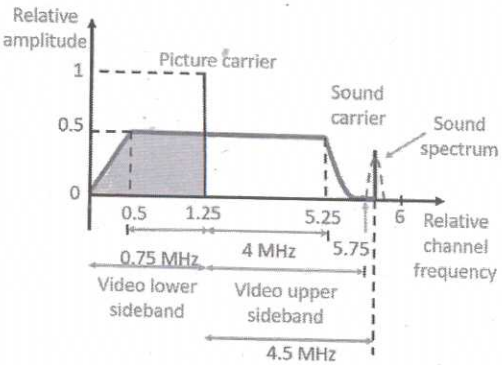
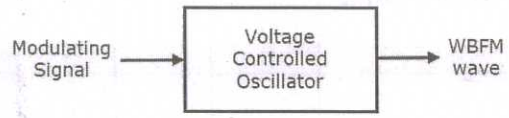
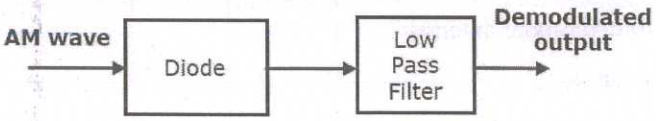
SCHEME OF VALUATION
(Scoring indicators)

A	Revision : 2015 Course Code: 3041 Course Title : COMMUNICATION ENGINEERING			
Qst. No.	**Scoring Indicator**	**Split up score**	**Sub Total**	**Total**
I 1	Refers to the directional (angular) dependence of the strength of the radio waves from the antenna or other source.	2	2	
I 2	Switched beam, phased array and adaptive array antenna	2 (any two)	2	
I 3	The sampling theorem states that, "a signal can be exactly reproduced if it is sampled at the rate fs which is greater than twice the maximum frequency W."	2	2	
I 4	1) Indirect: These types of demodulator use a phase-locked loop(PLL) to match a local oscillator to the modulated carrier frequency. (2) Direct: This methods employ discriminators, which are devices, that discriminate one frequency from another by transforming frequency changes into amplitude changes.	2	2	
I 5	Selectivity is the ability of selecting a particular signal, while rejecting the others. Sensitivity is the capacity of detecting RF signal and demodulating it, while at the lowest power level.	2	2	
II 1	 **FIGURE 8-12 Ground-wave propagation.** Ground wave propagation of the wave follows the contour of earth. Such a wave is called as direct wave. The wave sometimes bends due to the Earth's magnetic field and gets reflected to the receiver. Such a wave can be termed as reflected wave.	3+3	6	
II 2	 A parabolic antenna is an antenna that uses a parabolic reflector, a curved surface with the cross-sectional shape of a parabola, to direct the radio waves. The most common form is shaped like a dish and is popularly called a dish antenna or parabolic dish.	6	6	

II 3		**3+ 3 (working)**	**6**	
II 4	 DSBSC  SSBSC  Spectrum of transmitted TV signal using VSB transmission Electronics Coach	**2+2+2**	**6**	
II 5	• Improve the wire quality • Use thicker cables with low loss • Provide minumum bending radius • Provide tight connections • Use low noise amplifiers and splitters • Employ noise filters/removers	**6**	**6**	
II 6	Direct Method This method is called as the Direct Method because we are generating a wide band FM wave directly. In this method, Voltage Controlled Oscillator (VCO) is used to generate WBFM. VCO produces an output signal, whose frequency is proportional to the input signal voltage. This is similar to the definition of FM wave. The block diagram of the generation of WBFM wave is shown in the following figure.	**3+3**	**6**	

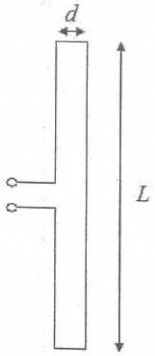
				
II 7	 This envelope detector consists of a diode and low pass filter. Here, the diode is the main detecting element. Hence, the envelope detector is also called as the diode detector. The low pass filter contains a parallel combination of the resistor and the capacitor.	4+2	6	
III a	Virtual Height When a wave is refracted, it is bent down gradually, but not sharply. However, the path of incident wave and reflected wave are same if it is reflected from a surface located at a greater height of this layer. Such a greater height is termed as virtual height. Critical Frequency Critical frequency for a layer determines the highest frequency that will be returned down to the earth by that layer, after having been beamed by the transmitter, straight up into the sky. The rate of ionization density, when changed conveninetly through the layers, the wave will be bent downwards. The maximum frequency that gets bent and reaches the receiver station with minimum attenuation, can be termed as critical frequency. This is denoted by fc. Skip Distance The measurable distance on the surface of the Earth from transmitter to receiver, where the signal reflected from the ionosphere can reach the receiver with minimum hops or skips, is known as skip distance. Maximum Usable Frequency (MUF) The Maximum Usable Frequency (MUF) is the highest frequency delivered by the transmitter regardless of the power of the transmitter. The highest frequency, which is reflected from the ionosphere to the receiver is called as critical frequency, fc. $MUF = \frac{Critical\ frequency}{\cos\theta} = f_c \sec\theta$	2+2+2 +2	8	15
III b	A folded dipole is an antenna, with two conductors connected on both sides, and folded to form a cylindrical closed shape, to which feed is given at the center. The length of the dipole is half of the wavelength. Hence, it is called as half wave folded dipole antenna. The following are the advantages of half-wave folded dipole antenna – • Reception of balanced signals.	6	6	

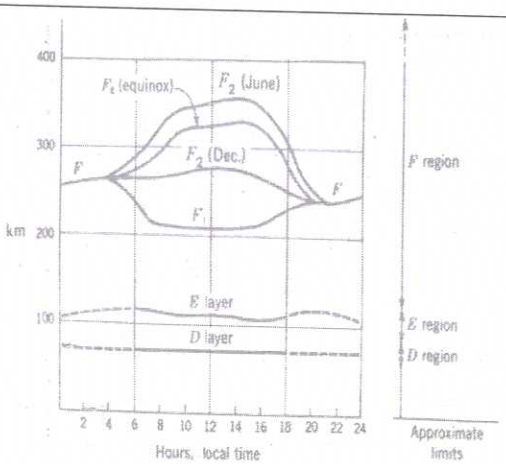
- Receives a particular signal from a band of frequencies without losing the quality.
- A folded dipole maximizes the signal strength.

Disadvantages

The following are the disadvantages of half-wave folded dipole antenna –

- Displacement and adjustment of antenna is a hassle.
- Outdoor management can be difficult when antenna size increases.





IV a

The Ionosphere is sub divided in to following layers

1. D Layer

This layer is located above the stratosphere. Its range is from 30 miles to 70 miles with reference is the surface of the earth.

The intensity of ionization is higher in the D-layer because it is composed of the heavier gasses.

2. E Layer

This layer is located above the D-layer. Its range is from 70 to 100 miles, with reference to the surface of the earth. The intensity of ionization is lessor in the E-layer with respect to D-Layer because it is composed of the less heavy gasses with respect to D-Layer.

3. F1 Layer

This layer is located above the E-Layer. Its range is from 100 to 150 miles with respect to the earth. The intensity of ionization is lessor in the F1 layer with respect to E-Layer because it is composed of the less heavy gasses then the F1 Layer.

4. F2 Layer

This layer is located above the F1 layer. Its range is from 150 miles to 250 miles with respect to earth. The intensity of ionization is lessor in the F2 layer with respect to F1 layer. Because it is composed of the less heavy gasses then the F2 Layer.

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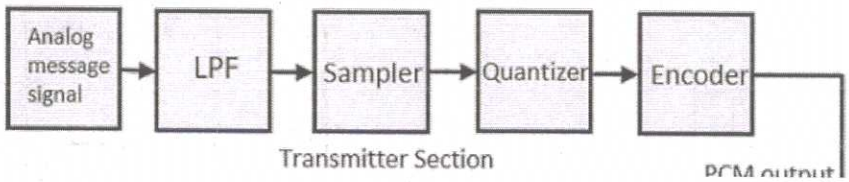
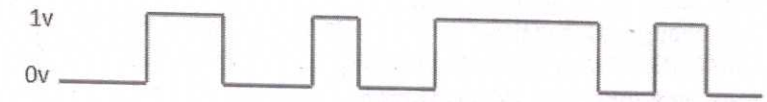
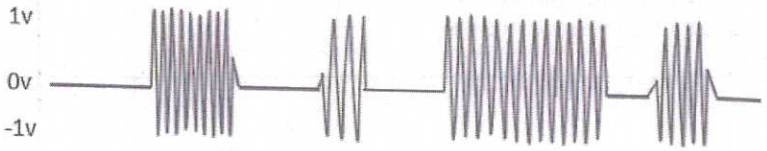
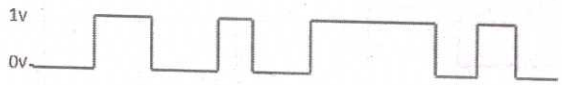
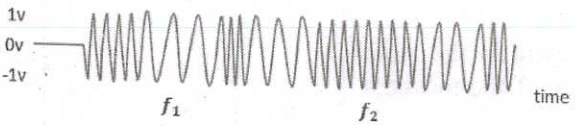
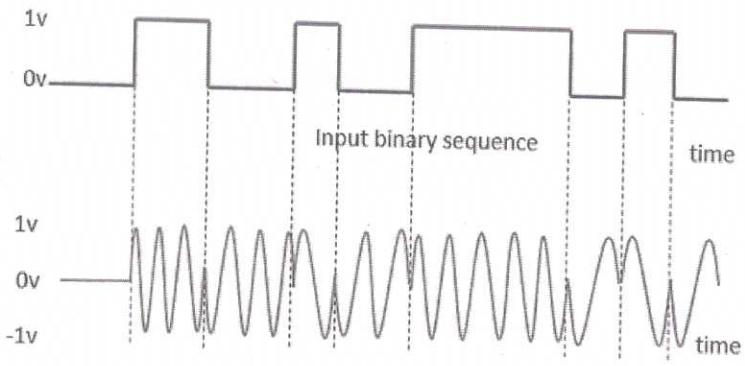
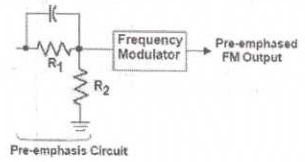
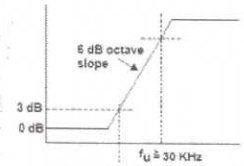
IV b	MANET is a self configuring network of mobile routers connected by wireless links with no access point. Every mobile device in a network is autonomous. The mobile devices are free to move haphazardly and organize themselves arbitrarily. Nodes in the MANET share the wireless medium and the topology of the network changes erratically and dynamically. Applications of MANET: Military Sector : Military equipment now routinely contains some sort of computer equipment. Ad- hoc networking would allow the military to take advantage of commonplace network technology to maintain an information network between the soldiers, vehicles, and military information headquarters. Commercial Sector: Ad hoc can be used in emergency/rescue operations for disaster relief efforts, e.g. in fire, flood, or earthquake. Low Level: Appropriate low level application might be in home networks where devices can communicate directly to exchange information. Data Networks: A commercial application for MANETs includes ubiquitous computing. By allowing computers to forward data for others, data networks may be extended far beyond the usual reach of installed infrastructure. Sensor Networks: This technology is a network composed of a very large number of small sensors. These can be used to detect any number of properties of an area. Examples include temperature, pressure, toxins, pollutions, etc.	6	6	
V a	• Antenna size gets reduced. • No signal mixing occurs. • Communication range increases. • Multiplexing of signals occur. • Adjustments in the bandwidth is allowed. • Reception quality improves.	8	8	
V b	 Low Pass Filter This filter eliminates the high frequency components present in the input analog signal which is greater than the highest frequency of the message signal, to avoid aliasing of the message signal. Sampler This is the technique which helps to collect the sample data at instantaneous values of message signal, so as to reconstruct the original signal. The sampling rate must be greater than twice the highest frequency component **W** of the message signal, in accordance with the sampling theorem. Quantizer	7	7	15

	Quantizing is a process of reducing the excessive bits and confining the data. The sampled output when given to Quantizer, reduces the redundant bits and compresses the value. Encoder The digitization of analog signal is done by the encoder. It designates each quantized level by a binary code.			
VI a	**Amplitude Shift Keying (ASK)** is a type of Amplitude Modulation which represents the binary data in the form of variations in the amplitude of a signal.  Input binary sequence  ASK Modulated output wave **Frequency Shift Keying (FSK)** is the digital modulation technique in which the frequency of the carrier signal varies according to the discrete digital changes. FSK is a scheme of frequency modulation.  Input binary sequence time  FSK Modulated output wave **Phase Shift Keying (PSK)** is the digital modulation technique in which the phase of the carrier signal is changed by varying the sine and cosine inputs at a particular time. PSK technique is widely used for wireless LANs, bio-metric, contactless operations, along with RFID and Bluetooth communications.	**9**	**9**	**15**

	 BPSK Modulated output wave			
VI b	Let the modulating signal be, $$m(t) = A_m \cos(2\pi f_m t)$$ and the carrier signal be, $$c(t) = A_c \cos(2\pi f_c t)$$ Where, A_m and A_c are the amplitude of the modulating signal and the carrier signal respectively. f_m and f_c are the frequency of the modulating signal and the carrier signal respectively. Then, the equation of Amplitude Modulated wave will be $$s(t) = [A_c + A_m \cos(2\pi f_m t)] \cos(2\pi f_c t)$$ (Equation 1)			
VII a	1. **External noises**, i.e. noise whose sources are external. External noise may be classified into the following three types: 1. ***Atmospheric noises*** 2. ***Extraterrestrial noises*** 3. ***Man-made noises or industrial noises.*** 2. **Internal noise in communication**, i.e. noises which get, generated within the system. Internal noise may be put into the following four categories. 1. ***Thermal noise or white noise or Johnson noise*** 2. ***Shot noise.*** 3. ***Transit time noise*** 4. ***Miscellaneous internal noise.***	**9**	**9**	**15**
VII b	**Pre-Emphasis Circuit:** At the transmitter, the modulating signal is passed through a simple network which amplifies the high frequency, components more than the low-frequency components.	**3+3**	**6**	



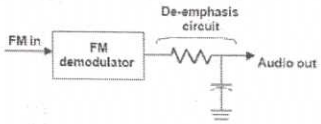
(a) Pre-emphasis Circuit



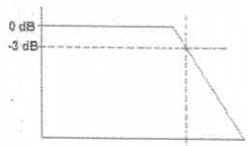
(b) Pre-emphasis Curve

De-Emphasis Circuit:

To return the frequency response to its normal level, a de-emphasis circuit is used at the receiver.

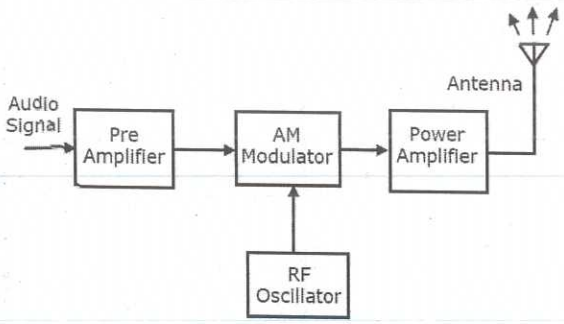


(c) De-emphasis circuit



(d) De-emphasis Curve

VII I a



The working of AM transmitter can be explained as follows.

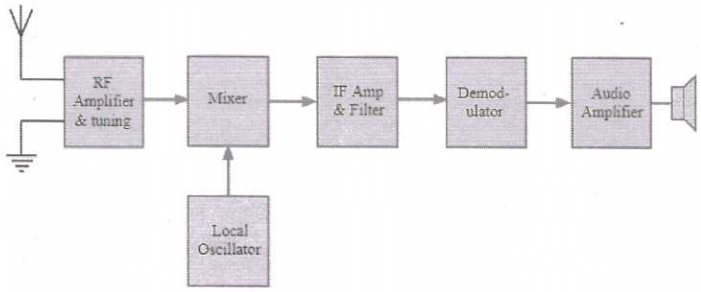
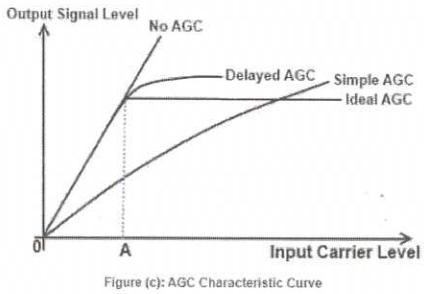
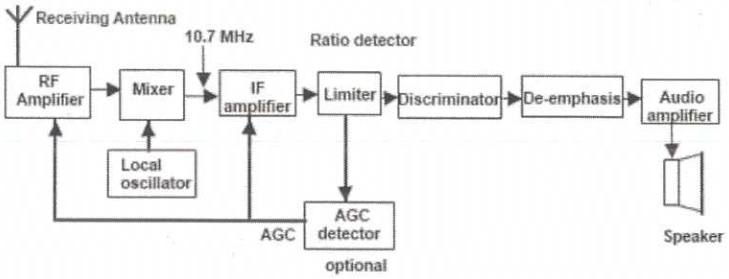
- The audio signal from the output of the microphone is sent to the pre-amplifier, which boosts the level of the modulating signal.
- The RF oscillator generates the carrier signal.
- Both the modulating and the carrier signal is sent to AM modulator.
- Power amplifier is used to increase the power levels of AM wave. This wave is finally passed to the antenna to be transmitted.

15

VII I b

signal-to-noise ratio, is a measure of signal strength relative to background noise. The ratio is usually measured in decibels (dB) using a signal-to-noise ratio formula. If the incoming signal strength in microvolts is

6 **6**

	V_s, and the noise level, also in microvolts, is V_n, then the signal-to-noise ratio, S/N, in decibels is given by the formula: $S/N = 20 \log_{10}(V_s/V_n)$ Noise figure is defined as the ratio between the input signal noise ratio (SNR) and output signal noise ratio.			
IX a	 Block diagram of a basic superheterodyne receiver	**6+2(explanation)**	**8**	**15**
IX b	 Figure (c): AGC Characteristic Curve **i. Simple AGC:** the gain control mechanism is active for high as well as low value of carrier voltage. **ii. Delayed AGC:** AGC bias is not applied to the amplifiers until signal strength crosses a predetermined level, after which AGC bias is applied.	**3 (chara with simple and delaye d AGC curve)** **2+2**	**7**	
X a	 Superheterodyne FM Receiver Block Diagram	**7 + 3(explanation)**	**10**	**15**
X b	Amplitude limiter in FM receivers are used to remove the amplitude variations. The limiter does this by clipping the received modulated wave. In FM signal the frequency of the carrier is varied. So if there are any variations in the amplitude of the received wave, it is due to noise or interference in the communication channel. So these amplitude variations are remover by the amplitude limiters.	**5**	**5**	