SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
Siddharth Nagar, Narayanavanam Road – 517581
QUESTION BANK (DESCRIPTIVE)

Subject with Code: Analog Communications (20EC0405)   **Course & Branch**: B.Tech. - ECE

Regulation: R20   **Year & Sem:** II-B.Tech. & I-Sem

UNIT –I
AMPLITUDE MODULATION - I

1 a) Define Communication and brief about different types of communications.   [L1] [CO1] [4M]
   b) Explain the elements of communication system with a neat block diagram.   [L2] [CO1] [8M]

2 a) Define modulation. Classify different types of modulation.   [L2] [CO2] [6M]
   b) Explain the need for Modulation.   [L2] [CO1] [6M]

3 a) Define Amplitude Modulation. Derive expression for AM wave and sketch its   [L3] [CO2] [8M]
      frequency spectrum.
   b) Determine the Modulation index & Bandwidth of AM.   [L3] [CO1] [4M]

4 a) Derive the expression for total transmitted power of AM wave and comment on   [L3] [CO2] [6M]
      the power wastage in AM
   b) An AM transmitter radiates 9kW of power when the carrier is un-modulated   [L3] [CO3] [6M]
      and 10.125kW of power when the carrier is sinusoidal modulated. Find the
      modulation index & Percentage modulation. Now if another sine wave
      corresponding to 40% modulation is transmitted simultaneously. Calculate
      total radiated power.

5 a) Derive the expression for transmission efficiency of AM.   [L3] [CO3] [5M]
   b) A given AM broadcast station transmits a total power of 5kW when the carrier   [L3] [CO3] [7M]
      is modulated by sinusoidal signal with a modulation index of 0.7071. Find the
      Carrier power and Transmission Efficiency.

6 a) Illustrate the Amplitude modulation for single tone information.   [L2] [CO2] [6M]
   b) A modulating signal $10 \, sin \, (2\pi \times 10^3 t)$ is used to modulate a carrier signal   [L3] [CO3] [6M]
      $20 \, sin \, (2\pi \times 10^4 t)$. Compute the modulation index, % of modulation index,
      frequency of sideband components and their amplitudes. What will be the
      bandwidth of modulated signal?

7 a) Explain the generation of AM wave using square-law modulator along with   [L2] [CO4] [7M]
      suitable diagram and analysis.
   b) What are the advantages and disadvantages of AM?   [L1] [CO1] [5M]

8 a) With a neat diagram and relevant equations, explain the generation of AM   [L2] [CO4] [8M]
      wave using Switching modulator.
   b) Define demodulation. List different types of AM demodulators.   [L1] [CO4] [4M]

9 a) Discuss about square-law demodulation of an AM wave.   [L2] [CO4] [7M]
   b) List the features and applications of AM   [L1] [CO1] [5M]

10 a) How a modulating signal can be detected using envelope detector? Explain.   [L2] [CO4] [6M]
   b) Explain the block diagram of AM transmitter.   [L2] [CO2] [6M]

UNIT-II
AMPLITUDE MODULATION - II

1 a) What is DSB-SC Modulation? Explain the time and frequency domain [L2] [CO2] [6M]
      expressions of DSB-SC wave.
   b) Derive the expression for DSB-SC Modulation of single tone information [L3] [CO2] [6M]
      and list the advantages and disadvantages of DSB-SC signal
2 a) Derive the expression for total transmitted power of DSB-SC wave. [L3] [CO4] [5M]
   b) Prove that the Balanced Modulator produces an output consisting of [L3] [CO4] [7M]
      sidebands only with carrier removed.
3 a) Explain the functionality of Ring modulator for generation of DSB-SC wave. [L2] [CO2] [8M]

   b) Calculate the Transmission bandwidth of DSB-SC wave & power saving. [L3] [CO3] [4M]
4 a) Explain coherent detection of DSB-SC wave with a neat block diagram and [L2] [CO2] [6M]
      relevant equations
   b) Illustrate the effect of phase error on the output of coherent detector and [L3] [CO3] [6M]
      calculate the percentage of power saving for a DSB-SC signal for the percent
      modulation of 100% and 50%
5 a) Define Hilbert Transform and List its properties. [L2] [CO2] [5M]

   b) Explain single tone modulation for transmitting only upper side band (USB) [L2] [CO2] [7M]
      frequency of SSB modulation.

6 a) Sketch and explain the block diagram of SSB-SC signal generation using [L2] [CO2] [6M]
      frequency discrimination method and list the drawbacks.
   b) Derive the power calculations of SSB-SC. [L2] [CO2] [6M]
7 a) With a neat block diagram explain the operation of phase discrimination [L2] [CO2] [8M]
      method using SSB and list the drawbacks.
   b) Determine the total power content of DSB-SC and SSB-SC. Assume the [L3] [CO3] [4M]
      amplitude and frequency of modulating signal is 6V and 10kHz respectively,
      amplitude and frequency of carrier signal is 12V and 700kHz.
8 a) What are the advantages and disadvantages of SSB-SC signal? [L1] [CO1] [6M]
   b) The power of an SSB transmission is 10kW. This transmission is to be [L3] [CO4] [6M]
      replaced by a standard AM signal with the same power content.
      Calculate the power content of the carrier and each of the sidebands
      when the percentage modulation is 80%.
9 a) Explain the principle of coherent detection of SSB-SC modulated wave with [L2] [CO2] [6M]
      a neat block diagram.
   b) Calculate the percentage power saving for SSB signal if AM wave is [L3] [CO3] [6M]
      modulated for a depth of a) 100% b) 50%
10 a) Explain the scheme for generation of VSB modulated wave. [L2] [CO2] [2M]
   b) List the applications of VSB and its features [L2] [CO2] [4M]
   c) Compare different types of Amplitude modulation techniques. [L2] [CO2] [6M]

UNIT – III
ANGLE MODULATION

1   a) Define angle modulation. Classify different types of angle modulation and write their mathematical expressions.   [L2] [CO1]   [6M]

    b) Define FM and derive the expression with necessary waveforms.   [L3] [CO3]   [6M]

2   a) Analyze the expression of single tone NBFM.   [L4] [CO3]   [5M]

    b) What are the advantages, disadvantages, and applications of FM.   [L2] [CO2]   [7M]

3   a) Compare between the AM & FM   [L2] [CO4]   [5M]

    b) Explain the generation of NBFM and WBFM.   [L2] [CO2]   [7M]

4   a) What are the differences between NBFM &WBFM?   [L1] [CO2]   [6M]

    b) Explain the generation of FM using direct method   [L2] [CO2]   [6M]

5   a) Explain the working principle of Varactor Diode Modulator.   [L2] [CO2]   [6M]

    b) Explain the block diagram of indirect method in FM generation.   [L2] [CO2]   [6M]

6   a) Discuss about transmission bandwidth & Carson's rule of FM signal.   [L2] [CO2]   [5M]

    b) A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is: (i) 1 kHz (ii) 15 kHz   [L3] [CO3]   [7M]

7   a) Explain the detection of FM wave using balanced frequency discrimination.   [L2] [CO2]   [6M]

    b) Describe about the functionality of zero crossing detector.   [L2] [CO2]   [6M]

8   a) Demonstrate the working principle of PLL.   [L3] [CO3]   [6M]

    b) Define PM and derive the expression with necessary waveforms.   [L2] [CO2]   [6M]

9   a) Compare between the AM & PM   [L2] [CO4]   [5M]

    b) Explain clearly about Pre-Emphasis and De-Emphasis circuits in FM.   [L2] [CO2]   [7M]

10 a) Explain and draw the block diagram of FM transmitter.   [L2] [CO1]   [6M]

    b) A single-tone FM is represented by the voltage equation as: [L3] [CO3]   [6M]

$$v(t) = 12 \cos \cos (6 \times 10^6 t + 5 \sin \sin 1250t) \ . \quad \text{Determine the}$$

following:

(i) Carrier frequency (ii) Modulating frequency (iii) Modulation index

(iv) What power will this FM wave dissipate in 10Ω resistors?

UNIT – IV
RADIO RECEIVER AND NOISE

1 a) What are the characteristics of radio receivers? [L1] [CO1] [4M]
  b) Write a short note on sensitivity, selectivity, fidelity & image [L2] [CO1] [8M]
     frequency.
2 a) Write a short note on double spotting and tracking. [L2] [CO1] [4M]
  b) Draw the block diagram of Super-heterodyne AM receiver and explain [L2] [CO6] [8M]
     function of each block.
3 a) What are the advantages & disadvantages of super heterodyning? [L1] [CO6] [5M]
  b) For a broadcast Super-heterodyne AM receiver having no RF amplifier, [L3] [CO6] [7M]
     the loaded Quality factor of the antenna coupling circuit is 100. Now, if
     the intermediate frequency is 455kHz, determine the image frequency
     and its rejection ratio at an incoming frequency of 1000kHz.
4 a) Sketch and explain the functionality of each block in Super-heterodyne [L2] [CO6] [7M]
     FM receiver.
  b) Define Noise and its classification. [L2] [CO1] [5M]
5 a) Write a short note on internal noise sources. [L1] [CO1] [7M]
  b) Describe about the thermal noise and white Gaussian noise. [L2] [CO1] [5M]
6 a) Explain effective noise temperature and noise figure. [L2] [CO1] [6M]
  b) A mixer stage has a noise figure of 20 dB and it is preceded by another [L3] [CO5] [6M]
     amplifier with a noise figure of 9 dB and an available power gain of 15
     dB. Calculate the overall noise figure referred to the input.
7 a) An amplifier operating over the frequency range from 18 to 20 MHZ [L2] [CO5] [6M]
     has a 10KΩ input resistor. What is the rms noise voltage at the input to
     this amplifier if ambient temperature is $27^{o}C$.
  b) Define (i) Input S/N ratio &(ii) Output S/N ratio (iii) Signal to Noise [L2] [CO5] [6M]
     Ratio (iv) Figure of merit
8 Derive the expression for figure of merit of AM (DSB-FC) system. [L3] [CO5] [12M]
9 a) Derive the expression for output SNR of DSB-SC system. [L3] [CO5] [8M]
  b) Calculate the input signal to noise ratio for an amplifier with an output [L3] [CO5] [4M]
     signal to noise ratio of 16 dB and a noise figure of 5.4 dB.
10 a) Prove that the figure of merit for SSB-SC is 1. [L3] [CO5] [8M]
   b) Compare the noise performance of SSB-SC system with that of DSB- [L4] [CO5] [4M]
      SC system.

UNIT – V
ANALOG PULSE MODULATION SCHEMES AND INFORMATION THEORY

1	a)	Define Analog pulse modulation and its classification	[L2] [CO1]	[5M]
	b)	Explain the generation of PAM with mathematical analysis.	[L2] [CO4]	[7M]
2	a)	Discuss about the demodulation of PAM signals.	[L2] [CO2]	[7M]
	b)	Derive the transmission bandwidth of PAM signal.	[L3] [CO4]	[5M]
3	a)	For a pulse-amplitude modulated transmission of voice signal having maximum frequency equal to 3kHz, calculate the transmission bandwidth. It is given that the sampling frequency 8kHz and pulse duration $0.1T_s$.	[L3] [CO4]	[7M]
	b)	What are the advantages and disadvantages of PAM?	[L1] [CO4]	[5M]
4		With a neat sketch, explain the modulation & demodulation of Pulse Duration Modulation.	[L2] [CO3]	[12M]
5	a)	Describe how a PPM signal can be generated and detected from PWM signal.	[L2] [CO4]	[8M]
	b)	What are the advantages and disadvantages of PPM?	[L1] [CO4]	[4M]
6	a)	List the comparisons among PAM, PWM and PPM.	[L1] [CO4]	[5M]
	b)	Briefly discuss about Time Division Multiplexing.	[L2] [CO2]	[7M]
7	a)	Briefly discuss about the frequency division multiplexing.	[L2] [CO2]	[8M]
	b)	Differentiate between TDM & FDM.	[L2] [CO2]	[4M]
8	a)	Explain about information content of message and information rate.	[L2] [CO6]	[6M]
	b)	A source produces one of four possible symbols during each interval having probabilities $P(x_1) = 1/2$, $P(x_2) = 1/4$, $P(x_3) = P(x_4) = 1/8$. Obtain the information content of each of these symbols.	[L3] [CO6]	[6M]
9	a)	Define Entropy and Mutual information.	[L2] [CO6]	[6M]
	b)	An analog signal band limited to 10KHZ is quantized eight levels of a PCM system with probabilities 1/2, 1/4, 1/5, 1/5, 1/10, 1/10, 1/20, 1/20. Find Entropy & Rate of information.	[L3] [CO6]	[6M]
10	a)	Discuss about channel capacity theorem.	[L2] [CO6]	[3M]
	b)	Illustrate the concept of Shannon's encoding algorithm.	[L2] [CO6]	[4M]
	c)	Given four messages with probabilities 0.1, 0.2, 0.3, 0.4. Construct a binary code by using Shannon-Fano algorithm. Find η and γ.	[L3] [CO6]	[5M]

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QUESTION BANK (OBJECTIVE)

Subject with Code: ANALOG COMMUNICATIONS (20EC0405)   **Course & Branch:** B.Tech - ECE
Year & Sem: II-B.Tech & I-Sem   **Regulation:** R20

UNIT –I
AMPLITUDE MODULATION – I

1. Modulation is the process of   [   ]

   A) generating constant-frequency radio waves

   B) combining audio and radio-frequency waves at the transmitting end of a communication system

   C) reducing distortion in RF amplifiers

   D) improving thermal stability of a transistor

2. Regarding amplitude modulation, which statement is false?   [   ]

   A) amplitude of carrier wave is varied by the signal voltage

   B) frequency of carrier wave remains unchanged

   C) outline of the modulated carrier wave is different in shape from the modulating wave

   D) amplitude of the modulated wave varies at frequency equal to the frequency of the modulating signal

3. Maximum undistorted power output of a transmitter is obtained when its modulation is-percent.[   ]

   A) more than 100   B) 100   C) less than 100   D) 50

4. The noise performance of a square-law demodulator of AM signal is   [   ]

   A) better than that of an envelope detector

   B) better than that of a synchronous detector

   C) identical with that of a synchronous detector

   D) poorer than that detector

5. If in a broadcasting studio, a 1000 kHz carrier is modulated by an audio signal of frequency range 100 -
   5000 Hz, the width of channel is- kHz.   [   ]
   A) 5   B) 4.9   C) 995   D) 10

6. A transmitter supplies 10 kW of carrier power to the antenna. The total radiated power with 40%
   modulation is ? kW.   [   ]
   A) 14   B) 10.8   C) 1.6   D) 25

7. With 100% modulation, ratio of sideband power to total power transmitted in an amplitude-modulated
   wave is   [   ]
   A) 2/3   B) 1/3   C) 1/2   D) 1/4

8. Demodulation   [   ]
   A) is performed at the transmitting station   B) removes side-bands
   C) rectifies modulated signal   D) is opposite of modulation

9. Given a carrier frequency of 100 kHz and a modulating frequency of 5 kHz, then what is the bandwidth
   of AM transmission (kHz).   [   ]
   A) 5   B) 200   C) 10   D) 20

10. The minimum height of antenna required for transmission in terms of Λ is_____   [   ]
    A) $\frac{3\Lambda}{2}$ B) $\frac{\Lambda}{4}$ C) 2Λ D) Λ

11. Medium which sends information from source to receiver is called_____   [   ]
    A) Transmitter   B) Transducer   C) Loudspeaker   D) Channel

12. Telephones send information through wires in form of_____   [   ]
    A) radio signals   B) electrical signal C) electromagnetic waves D) microwaves

13. Cell phones sent information in form of_____   [   ]
    A) microwaves   B) electrical signals C) infrared Waves   D) radio waves

14. Square Law modulators are_____   [   ]
    A) used for frequency modulation   B) used for pulse width modulation
    C) used for amplitude modulation   D) used for phase modulation

15. In amplitude modulation frequency and phase of carrier_____   [   ]

    A) varies simultaneously   B) varies alternately

    C) initially varies but become same after sometime   D) remains constant

16. Envelope of AM wave has the same shape as the message of baseband signal.   [   ]

    A) True   B) False

17. Why AM is used for broadcasting?   [   ]

    A) More immune to noise   B) less transmitting power is required

    C) It has high fidelity   D) Avoids Receivers Complexity

18. Single tone amplitude modulation_____   [   ]

    A) consists of only one frequency component

    B) contains a large number of frequency components

    C) contains no frequency components

    D) contains infinite number of frequency components

19. AM spectrum consists of_____   [   ]

    A) Carrier frequency   B) Upper sideband

    C) Lower sideband   D) Carrier frequency with both upper and lower sideband

20. Calculate power in each sideband, if power of carrier wave is 176W and there is 60% modulation in

    amplitude modulated signal?   [   ]

    A) 13.36W   B) 52W   C) 67W   D) 15.84W

21. Which of the following devices is used to generate AM waves?   [   ]

    A) Square-law modulator   B) Reactance modulator

    C) Transmitter   D) Transducer

22. Over modulation results in_____   [   ]

    A) Distortion   B) Weakens signal

    C) Strengthens the signal   D) provides immunity to noise

23. An AM signal is represented by $x(t) = (30 + 2\mathrm{Sin}(700\pi t))\,\mathrm{Cos}(2\pi t \times 10^2 t)\mathrm{V}$. What is the value of

    modulation index?   [   ]

    A) 0.7   B) 0.066   C) 0.341   D) 0.916

24. An AM signal is represented by $x(t) = (30 + 2Sin(700\pi t)) \, Cos(2\pi t \times 10^2 t)$V. Carrier power of the wave is? [   ]

    A) 555W   B) 675W   C) 450W   D) 310W

25. An AM signal is represented by $x(t) = (30 + 2Sin(700\pi t)) \, Cos(2\pi t \times 10^2 t)$V. Find the total power of amplitude modulated wave? [   ]

    A) 453W   B) 675W   C) 789W   D) 451W

26. If the modulating frequency of a carrier wave varies between 700Hz and 7 KHz, find its bandwidth?

                                                                                            [   ]

    A) 10 KHz   B) 23 KHz   C) 17.3 KHz   D) 12.6 KHz

27. A 400W carrier wave is modulated to a depth of 65%. Find the total power of modulated wave?

                                                                                            [   ]

    A) 512.5W   B) 493W   C) 484.5W   D) 609.6W

28. If modulation index of an AM wave is increased from 1.5 to 2, then the transmitted power is [   ]

    A) remains same   B) increases by 20%

    C) increases by 41%   D) increases by 50%

29. If peak voltage of a carrier wave is 10V, what is the peak voltage of modulating signal if modulation index is 50%? [   ]

    A) 10V   B) 20V   C) 8V   D) 5V

30. For 100% modulation, total power is _____   [   ]

    A) $1.5P_c$ B) $2P_c$ C) $3.75P_c$ D) $1.25P_c$

31. Power of carrier wave is 300W and modulation index is 0.75. Find its total power? [   ]

    A) 465W   B) 384W   C) 323W   D) 502W

32. Which is/are continuous wave modulation?   [   ]

    A) AM   B) FM   C) PM   D) All

32. Envelope Detector is a/an_____   [   ]

    A) Coherent detector   B) Asynchronous Detector

    C) Synchronous Detector   D) Product Demodulator

33. For low level amplitude modulation, amplifier must be_____   [   ]

    A) Class C amplifier   B) Class B amplifier

    C) Class D amplifier   D) Class A amplifier

34. Square law modulators   [   ]

    A) Have non linear current-voltage characteristics   B) Are used for Amplitude Modulation

    C) Are used for frequency modulation   D) Both a and b are correct

35. AM demodulation techniques are   [   ]

    A) Square law demodulator   B) Envelope detector

    C) PLL detector   D) Both a and b are correct

36. The process of recovering information signal from received carrier is known as   [   ]

    A) Detection   B) Modulation   C) Demultiplexing   D) Sampling

37. In synchronous detection of AM signal   [   ]

    A) Carrier is locally generated   B) Passed through a low pass filter

    C) The original signal is recovered   D) All of the above

38. In an Amplitude Modulation   [   ]

    A) Amplitude of the carrier varies   B) Frequency of the carrier remains constant

    C) Phase of the carrier remains constant   D) All of the above

39. Frequency components of an AM wave (m = modulation index) are   [   ]

    A) Carrier frequency (ω_c) with amplitude A

    B) Upper side band ($\omega_c + \omega_m$) having amplitude mA/2

    C) Lower side band ($\omega_c - \omega_m$) having amplitude mA/2

    D) All of the above

40. 100% modulation is produced in AM when carrier   [   ]

    A) frequency equals signal frequency   B) frequency exceeds signal frequency

    C) amplitude equals signal amplitude   D) amplitude exceeds signal amplitude

UNIT-II

AMPLITUDE MODULATION – II

1. Ring modulator is   [   ]
   A) Is used for DSB SC generation
   B) Consists of four diodes connected in the form of ring
   C) Is a product modulator
   D) All of the above

2. What is the maximum transmission efficiency of an AM signal?   [   ]
   A) 64.44%   B) 33.33%   C) 56.66%   D) 75.55%

3. Pilot carrier is   [   ]
   A) Used with DSB-SC signal
   B) A small carrier transmitted with modulated signal
   C) Used for synchronization with local carrier at the receiver
   D) All of the above

4. Generation of SSB SC signal is done by   [   ]
   A) Phase discrimination method   B) Frequency discrimination method
   C) Product modulator   D) Both a and b

5. Phase shift method is   [   ]
   A) Includes two balanced modulators   B) Two phase shifting networks
   C) Avoids the use of filters   D) All of the above

6. Vestigial side band signals are detected by   [   ]
   A) Filters   B) Synchronous detection
   C) Balanced modulator   D) None of the above

7. The costas receiver is used for   [   ]
   A) FM signal   B) DSB-SC signal   C) PCM signal   D) DM signal

8. The amount of power and bandwidth necessary to be transmitted for a given amount of information
   are reduced in_____   [   ]
   A) Single Sideband Modulation   B) Double Sideband Modulation
   C) Vestigial Sideband Modulation   D) Amplitude Modulation

9. Which of the following modulation system is used for video-modulation?   [   ]
   A) DSB-SC   B) SSB-SC   C) VSB   D) FM

10. In SSB modulation, only a single sideband is transmitted leaving the other sideband and the
    carrier.   [   ]
    A) True   B) False

11. Single Sideband Modulation (SSB) is generally reserved for point-to-point communication.
                                                                            [   ]
    A) True   B) False

12. For which of the modulated system, the linear amplified modulated stage is used?   [   ]
    A) low level amplitude modulated system
    B) high level amplitude modulated system
    C) high level frequency modulated system
    D) low level frequency modulated system

13. Costa's receiver is used for_____   [   ]
    A) coherent detection of AM-SC signal   B) asynchronous detection of AM-SC signal
    C) amplification of signal   D) frequency mixing of signal

14. What do you understand by the term SSB?   [   ]
    A) Suppressed Side Band   B) Single Side Band
    C) Suppressed Single Band   D) Selected Single Band

15. SSB is a standard form for radio communication.   [   ]
    A) True   B) False

16. VSB modulation is used in televisions because it avoids phase distortion at low frequencies.
                                                                                          [   ]
    A) True   B) False

17. What do you understand by the term "carrier" in modulation?   [   ]
    A) voltage to be transmitted
    B) resultant wave
    C) voltage for which amplitude, phase or frequency can be varied
    D) voltage for which amplitude, phase or frequency remains constant

18. A single sideband modulation system is more efficient than a plain AM system.   [   ]
    A) True   B) False

19. At peak modulation an SSB transmitter radiate 1000W, what will it radiate with no modulation?
                                                                                          [   ]
    A) 1000 watts   B) 500 watts   C) 250 watts   D) 0 watts

20. What is the total sideband power if there is 100% modulation?   [   ]
    A) half the carrier wave   B) twice the carrier wave
    C) equal to the carrier wave   D) one-fourth of the carrier wave

21. A single sideband modulation system requires a more complex demodulator circuit. [   ]
    A) True   B) False

22. The_____of an AM signal resembles the shape of baseband signal. [   ]
    A) upper band   B) lower band
    C) efficiency   D) envelope

23. If we compared to the USB, the power in the LSB is_____ [   ]
    A) one-fourth of USB   B) twice of USB
    C) same as USB   D) half of USB

24. If we compared to the USB, the information in LSB is_____ [   ]
    A) different to USB   B) twice of USB
    C) same as USB   D) half of USB

25. The SC in DSB-SC stands for_____ [   ]
    A) suppressed-carrier   B) single-carrier
    C) sideband-carrier   D) super-carrier

26. To generate a SSB signal_____ [   ]
    A) Full carrier AM is required   B) DSB-SC is required
    C) Quadrature signal is required   D) High frequency signal is needed

27. With 100% modulation, ratio of sideband power to total power transmitted in an amplitude-
    modulated wave is [   ]
    A) 2/3   B) 1/3   C) 1/2   D) 1/4

28. As compared to DSB-FC, 100% modulated transmission; power saving in SSB-SC system is what
    percent. [   ]
    A) 94.4   B) 0   C) 100   D) 83.3

29. Which of the following statement regarding single-sideband (SSB) transmission is not correct?
    [   ]
    A) in such transmission, only one sideband is transmitted, leaving off the other sideband and the
       carrier
    B) it has gained general acceptance for use in home-entertainment equipment
    C) it is generally reserved for point-to-point communication
    D) the amount of power and bandwidth necessary to be transmitted for a given amount of
       information are appreciably reduced.

30. Which one of the following methods cannot be used for suppressing unwanted side bands in SSB?
    [   ]
    A) phase-shift method   B) balanced modulator
    C) 'third' method   D) filter method

31. Which of the following will carry the same information as the AM wave itself ?   [   ]
    A) VSB only   B) VSB and SSB
    C) SSB, VSB and DSB   D) All of the above

32. Which of the following filter is generally used in SSB generation?   [   ]
    A) Active filter   B) Mechanical filter
    C) LC filter   D) Crystal filter

33. Which of the following is invariably found in SSB?   [   ]
    A) Tuned modulator   B) Class B RF amplifier
    C) Class C audio amplifier   D) All of the above

34. The unit of modulation index is   [   ]
    A) Hertz   B) $(Hz)^{-1}$
    C) $(Hz)^{-2}$ D) no unit

35. The bandwidth of DSB suppressed carrier modulation system when the modulating frequency
    varies between 100 Hz and 5 kHz is   [   ]
    A) 10 Hz   B) 10 kHz   C) 5 kHz   D) 4.9 kHz

36. In a 100% amplitude modulated signal, the power in the upper sideband when the carrier power is
    100 watts and the modulation system is SSBSC is   [   ]
    A) 25 watts   B) 100 watts   C) 50 watts   D) none of these

37. The percentage saving in power of 100% modulated SSBSC amplitude modulated signal as
    compared to DSB signal is   [   ]
    A) 100   B) 66.66   C) 150   D) 83.33

38. In a single side band suppressed carrier AM system, the modulation index is changed from 0 to 1.
    If the carrier power is 200 watts, the power content of the signal is   [   ]
    A) unchanged   B) doubled   C) halved   D) increased by 50 watts

39. The biggest advantage of VSB system is   [   ]
    A) that it conserves bandwidth and overcomes the problem of low video frequency attenuation
    B) lesser power requirement
    C) its bandwidth conservation
    D) simplicity of transmitter circuitry

40. One of the following is a disadvantage of the VSB system   [   ]
    A) It conserves bandwidth
    B) It results in a power boost of low video frequencies
    C) It overcomes the problem of low video frequency attenuation
    D) It is neither a DSB system nor an SSB system

UNIT – III
ANGLE MODULATION

1. FM signal is less affected by [   ]
   A) loss B) temperature C) freq D) noise

2. In FM modulation ,when the modulation index increases, transmitted power is [   ]
   A) constant B) increased C) decreased D) None

3. FM capture effect due to the following effects [   ]
   A) Limiter B) AGC C) Discriminator D) De emphasis

4. Which functional block readily identifies it is an FM receiver [   ]
   A) RF amp B) IF amp C) Detector D) mixer

5. The frequency tolerance of the FM broadcast station is [   ]
   A) 20Hz B) 200HZ C) 2000Hz D) 20KHZ

6. The frequency tolerance of the FM broadcast station is [   ]
   A) Receiving end B) Transmitting end C) In the Channel D) Before Demodulation

7. A 10MHz carrier is frequency modulated by a sinusoidal signal of 500Hz, the max frequency deviation being 50KHz. The bandwidth required as given by Carson's rule is [   ]
   A) 101KHz B) 125KHZ C) 102KHz D) 150KHZ

8. De-emphasis circuit resembles a [   ]
   A) LPF B) HPF C) BPF D) BEF

9. The carrying efficiency is best in [   ]
   A) AM B) FM C) AM-SC D) PM

10. Which of the following processes is a linear modulation process? [   ]
    A) NBFM B) WBFM C) NBPM D) none

11. FM broadcast band lies in [   ]
    A) VHF B) UHF C) SHF D) none

12. An increase in the modulation index leads to increase in bandwidth in case of [   ]
    A) AM B) FM C) PM D) none

13. In NBFM, the maximum modulation frequency is 3KHz and maximum deviation is 5KHz. The modulation index is [   ]
    A) less than 1 B) greater than1 C) equal to 1 D) None

14. In commercial FM broadcasting, the audio frequency range handled is only upto
[   ]

A) 15 khz   B)5khz   C) 3.5khz   D) None

15. The transmission bandwidth required for commercial FM broadcasting is   [   ]

A) 75 khz   B)10khz   C) 200khz   D) 220khz

16. The standard intermediate frequency used in the super hetrodyne FM receiver is
[   ]

A) 88Mhz   B) 455 Mhz   C) 15Mhz   D) 1.7Mhz

17. From bandwidth point of view, NBFM is equivalent to   [   ]

A) AM   B) PM   C) SSB   D) NONE

18. Let x(t)=5cos(20t+sin5t). Its instantaneous frequency (in rad/s) at t=0 has the value[   ]

A) 5   B) 50   C) 55   D) 250

19. The signal $cosw_ct+0.5cosw_ct*sinw_ct$ is   [   ]

A) AM   B) FM   C) Both   D) NONE

20. v(t)=5[cos(10^6πt)- sin(10^3πt)* sin(10^6πt)] represents   [   ]

A) AM   B) DSB-SC   C) SSB   D) NBFM

21. frequency modulation has   [   ]

| A) One carrier | B) one carrier with two side band frequencies | C) one carrier with infinite frequencies | D) None |

22. Modulation index for FM modulation is   [   ]

A) Δ f/f_m B) Δ f *f_m C) Δ f   D) A_m/f_m

23. ß in NBFM is   [   ]

A) ß < 1   B) ß $\leq$ 1   C) ß $\geq$1   D) ß > 1

24. ß in WBFM is   [   ]

A) ß < 1   B) ß $\leq$ 1   C) ß $\geq$1   D) ß > 1

25. Bandwidth of NBFM   [   ]

A) Same as AM   B) Same as SSB   C) Same as DSB-SC   D) Both A& C

26. The max change in instantaneous frequency from average frequency is called   [   ]

A) frequency deviation   B) frequency modulation   C) modulation index   D) All

27. Which statement is true about frequency multipliers?   [   ]

A) they are essentially balanced modulators   B) they are essentially class C amplifiers

C) they are essentially class AB amplifiers   D) they are essentially mixers

28. What is the full form of DTMF?   [   ]

A) Dual-Tone Multi frequency   B) Dual Telephony Multiple Frequency

C) Dual-Tone Minimum Frequency   D) Digital Tone Minimum Frequency

29. In Frequency Modulation –   [   ]

A) Amplitude of the carrier remains same

B) Frequency of the carrier varies in accordance with the modulating signal

C) The number of side bands are infinite

D) All of the above

30. Frequency deviation in FM is   [   ]

A) Change in carrier frequency to the frequency above and below the centre frequency

B) Formation of side bands

C) The variation of the instantaneous carrier frequency in proportion to the modulating signal

D) All of the above

31. Carrier swing is defined as   [   ]

A) The total variation in frequency from the lowest to the highest point

B) Frequency deviation above or below the carrier frequency

C) Width of the side band

D) None of the above

32. The amount of frequency deviation in FM signal depends on   [   ]

    A) Amplitude of the modulating signal   B) Carrier frequency

    C) Modulating frequency   D) Transmitter amplifier

33. Drawbacks of using direct method for generation of FM signal are   [   ]

    A) Does not give high stability to FM signal frequency

    B) Distorted FM signal is generated due to harmonics of modulating signal

    C) Cannot be used for high power FM generation

    D) Both a and b

34. Advantage of using direct method for generation of FM signal is   [   ]

    A) It gives high stability to FM signal frequency

    B) Distortion free FM signal is generated

    C) High power FM generation is possible

    D) None of the above

35. Drawbacks of Tuned Radio Receiver are   [   ]

    A) Oscillate at higher frequencies

    B) Selectivity is poor

    C) Bandwidth of the TRF receiver varies with incoming frequency

    D) All of the above

36. Sensitivity is defined as   [   ]

    A) Ability of receiver to amplify weak signals

    B) Ability to reject unwanted signals

    C) Ability to convert incoming signal into Image Frequency

    D) Ability to reject noise

37. Amplitude limiter in FM receivers are used to   [   ]

    A) Remove amplitude variations due to noise

    B) Filteration

    C) Demodulation

    D) Amplification

38. Pre emphasis is done   [   ]

A) For boosting of modulating signal voltage

B) For modulating signals at higher frequencies

C) In FM before modulation

D) All of the above

39. De emphasis is   [   ]

A) is restoring of original signal power

B) is done at the detector output of the receiver

C) is the inverse process of Pre emphasis

D) All of the above

40. Pre emphasis is done before   [   ]

A) Before modulation   B) Before transmission

C) Before detection at receiver   D) After detection at receiver

UNIT – IV

RADIO RECEIVER AND NOISE

1. The capacity of an analog communication channel with 4 kHz bandwidth and 15dB SNR is   [   ]

   A) 20000bps   B) 16000bps   C) 10000bps   D) 8000bps

2. High frequency noise is   [   ]

  A) Transit time noise   B) Flicker noise   C) Shot noise   D) None of the above

3. S/N ratio improvement is proportional to the square of the bandwidth of transmission in   [   ]

   A) FM   B) Conventional AM   C) AM-DSB-SC   D) AM-SSB-SC

4. The Signal to Noise ratio of DSB-SC Scheme is   [   ]

   A) 3   B) 2   C) 1   D) Zero

5. Which of the following demodulation methods exhibit threshold effect   [   ]

   A) Synchronous demodulation of AM   B) Envelope detection of AM

   C) Square law detector   D) Balanced demodulator

6. Noise performance of conventional AM, when compared with that of suppressed carrier systems is

        [   ]

   A) Superior   B) Inferior   C) Same   D) Can't be compared

7. TDM can be implemented using   [   ]

   A) AM   B) PAM   C) FM   D) VSB-AM

8. $f_s \gg 2f_m$ results in   [   ]

   A) Aliasing   B) Distortion   C) Inefficient Channel utilization   D) Attenuation

9. Which functional block readily identifies it is an FM receiver   [   ]

   A) RF amp   B) IF amp   C) detector   D) mixer

10. The width (τ) of a sample of a base band signal of band limited frequency fm can have a value

        [   ]

   A) $\tau < 1/fm$ B) $\tau > 1/fm$ C) $\tau = 1/fm$ D) $\tau \geq 1/fm$

11. The Signal to Noise ratio of SSB-SC scheme is   [   ]

   A) 3   B) 2   C) 1   D) 0

12. Noise voltage varies in resistor is   [   ]

   A) $4KTR_b$ B) $sqrt(4KTR_b)$ C) $2KTR_b$ D) $sqrt(2KTR_b)$

13. Which one of the following types of noise gain importance at high frequency?   [   ]

    A) Shot noise   B) Random noise   C) Impulse Noise   D) Transit-time noise

14. The capacity of an analog communication channel with 4kHz bandwidth and 15dB SNR is

    approximately   [   ]

    A) 20000bps   B) 16000bps   C) 10000bps   D) 8000bps

15. Anti-aliasing filter is a_____filter   [   ]

    A) LPF   B) HPF   C) BPF   D) All

16. Thermal noise is independent of   [   ]

-     A) Boltzmann's constant   B) temperature   C) Bandwidth   D) Center frequency

17. Noise performance of AM-DSB-SC signal is same as that of AM-SSB-SC system due to [   ]

    A) More i/p sig power B) More BW   C) Less i/p signal power   D) Less Noise power

18. Low frequency noise is   **[   ]**

    A) Transit time noise   B) Flicker noise   C) Shot noise   D) Thermal noise

19. Hilbert transform may be used in   [   ]

    A). Generation of SSB signals
    B). Representation of band pass signals
    C). Designing of minimum phase type filters
    D). All of the above

20. Noise performance of AM-DSB-SC signal is same as that of AM-SSB-SC system due to [   ]

    A) More i/p sig power   B) More bandwidth   C) Less i/p signal power D) Less Noise power

21. Threshold effect is:

    A). Reduction in output signal to noise ratio
    B). Large noise as compared to input signal to envelope detector
    C). Detection of message signal is difficult
    D). All of the above

22. Noise figure is also called as   [   ]

  A) Noise bandwidth   B) Noise temperature   C) Noise factor   D) none

23. The signal to noise ratio is expressed in---   [   ]

  A) dB   B) volts   C) amperes   D) KW

24. What is the auto correction function of white noise   [   ]

  A) Impulse Function   B) Step Function   C) Constant   D) Linear Function

25. Superheterodyne principle provides selectivity at _____ [   ]
A) RF stage
B) IF stage
C) Demodulating Stage
D) Audio Stage

26. Noise is added to a signal in a communication system [   ]

A) At the receiving end   B) At transmitting antenna

C) In the channel   D) During regeneration of the information

27. Which one of the following types of noise gain importance at high frequency [   ]

A) Shot noise B) Random noise   C) Impulse Noise   D) Transit-time noise

28. What is the function of radio receiver? [   ]
A) to detect and amplify information signal from the carrier
B) to modulate a message signal
C) to produce radio waves
D) to convert one form of energy into other

29. The Signal to Noise ratio of DSB-SC Scheme is [   ]

A)   3   B) 2   C) 1   D) Zero

30. Noise performance of conventional AM, when compared with that of suppressed carrier systems is

[   ]

A)   Superior   B)   C) Can't be compare
     Inferior   C) Same

31. The Signal to Noise ratio of SSB-SC scheme is

[   ]

A)   3   B) 2   C) 1   D) zero

32.   In a receiver,
noise is usually developed at _____ [   ]

A) Audio stage
B) Receiving antenna
C) RF stage
D) IF stage [   ]

33. A super heterodyne radio receiver with an intermediate frequency of 455 KHz is tuned to a stationoperating at 1200 KHz. The associated image frequency is -----------KHz [   ]

A) 1120HZ   B) 2110HZ   C) 2200HZ   D) 2000HZ

34.The image channel selectivity of super heterodyne receiver depends upon [   ]

A). IF   B) RF and IF   C) Pre selector, RF and   D) Pre selector and RF
amplifiers   amplifiers only   IF amplifiers   amplifiers

35.   Selectivity of a receiver: [   ]

    A) Changes with incoming signal frequency

    B) Is poorer at high frequencies

    C) Is the rejection of the adjacent channel at the receive

    D) All of the above

36. Intermediate frequency (IF) should be carefully chosen as   [   ]

    A)   High IF results in poor selectivity

    B) High IF results in problems in tracking of signals

    C) Image frequency rejection becomes poor at low IF

    D) All of the above

UNIT – V
ANALOG PULSE MODULATION SCHEMES AND INFORMATION THEORY

1. A PAM signal may be generated using [   ]
   A) Impulse sampling   B) A sample and hold circuit   C) Natural sampling   D) A clipper circuit

2. The impulse response function, h(t), of a zero-order-hold circuit is [   ]
   A) an impulse   B) A rectangular pulse   C) A triangular pulse   D) None

3. A band limited low pass signal is sampled at twice its nyquist rate with f_s=2000sps. The signal is band limited to [   ]
   A) 250Hz   B) 1000Hz   C) 500Hz   D) 2000Hz

4. A PAM signal may be demodulated using [   ]
   A) LPF   B) A differentiator followed by a LPF
   C) An integrator   D) A LPF followed by an equalizer

5. Aliasing occurs due to which of the following [   ]
   A) fs = 2 fm   B) Ts = 2 fm   C) fs = 1 / 2 fm   D) Ts = fm

6. A Pulse width modulated signal can be generated by [   ]
   A) An astable multivibrator   B) A monostable multivibrator
   C) Integrating the Sig   D) Differentiating the PPM signal

7. PWM can be demodulated using [   ]
   A) Integrator and LPF   B) Differentiator and LPF   C) Integrator and HPF   D) Differentiator and HPF

8. PPM can be generated from [   ]
   A) AM   B) FM   C) PWM   D) PM

9. Quantizing noise in a PCM system can be reduced by [   ]
   A) Decreasing the number of standard levels   B) Having more no.of samples per second
   C) Using low noise circuitry in PCM receiver   D) Increasing the number of standard levels

10. Which of the following is used to convert PPM into PWM [   ]
    A) Clipping Circuit   B) Bi-stable Multi-vibrator   C) Astable Multi-vibrator   D) Clamping

11. Pulse communication system that is inherently highly immune to noise is [   ]
    A) PWM   B) PAM   C) PPM   D) PCM

12. A PWM signal can be generated by [   ]
    A) mono-stable Multi-vibrator   B) Astable multi-vibrator
    C) Integrating the PPM signal   D) Differentiating the PPM signal

13. Aliasing occurs if ……… [   ]
    A) fs>2fm   B) fs=2fm   C) fs<2fm   D) none

14. PWM and PPM are the forms of …….. [   ]
    A) PAM   B) PCM   C) PTM   D) QAM

15.……….. is known as Nyquist rate.   [   ]
    A) fs=2fm   B) fs>2fm   C) fs<2fm   D) none

16. Which of the following is correct (FDM means Frequency Division Multiplexing and TDM means
    Time Division Multiplexing)?   [   ]
    A) FDM requires lower bandwidth but TDM has more noise immunity
    B) FDM has more noise immunity and requires lower bandwidth than TDM
    C) FDM requires channel synchronization while TDM has more noise immunity
    D) FDM requires more multiplexing while TDM requires band pass filter

17..…………. Modulation is mostly effected by noise.   [   ]
    A) PTM   B) PAM   C) PCM   D) PPM

18. To generate PWM signal ……… is used.   [   ]
    A) AMV   B) BMV   C) MMV   D) NONE

19.Transmitter power remains constant in ………. Pulse modulation.   [   ]
    A) PAM   B) PWM   C) PPM   D) PTM

20.Band-width remains constant in …….. Pulse modulation.   [   ]
    A) PAM   B) PPM   C) PTM   D) NONE

21. To demodulate PWM ……… is used.   [   ]
    A) Integrator   B) differentiator   C) Schmitt-trigger   D) none

22. In _____ modulation, the pulses of the carrier wave are varied according   [   ]
    to the message signal
A) PTM   B) PWM   C) PAM   D) PCM

23. The bandwidth requirement is high in _____   [   ]

A) PTM   B) PWM   C) PAM   D) PCM

24. The transmitted power in PAM varies with _____.   [   ]
    A) Amplitude of pulses
    B) Variation in width
    C) Remains constant
    D) None

25. To generate PPM signal, first PWM signal is generated then differentiator followed by [   ]
    A) Clamper   B) clipper   C) flip-flop   D) NONE.

26. The PPM used for ____   [   ]
    A) Optical communication system B) Military application C) Both a & b D) Aerospace

27. PPM and PDM systems suffer from a_____ similar to that experienced in FM System.
                                                                       [   ]
    A) threshold effect   B) Aliasing effect   C) Crosstalk   D) None

28 ....Modulation is mostly affected by noise.   [   ]
    A) PTM   B) PAM   C) PCM   D) PPM

29. The capacity of Gaussian channel is   [   ]
    A) C = 2B(1+S/N) bits/s   B) C = B2(1+S/N) bits/s
    C) C = B(1+S/N) bits/s   D) C = B(1+S/N)2 bits/s

30. For M equally likely messages, the average amount of information H is   [   ]
    A) H = log10M   B) H = log2M
    C) H = log10M2   D) H = 2log10M

31. The channel capacity is   [   ]
    A) The maximum information transmitted by one symbol over the channel
    B) Information contained in a signal
    C) The amplitude of the modulated signal
    D) All of the above

32. For M equally likely messages, M>>1, if the rate of information R ≤ C, the probability of error is
                                                                               [   ]
    A) Arbitrarily small   B) Close to unity
    C) Not predictable   D) Unknown

33. For M equally likely messages, M>>1, if the rate of information R > C, the probability of error is
                                                                               [   ]
    A) Arbitrarily small   B) Close to unity
    C) Not predictable   D) Unknown

34. The technique that may be used to increase average information per bit is   [   ]
    A) Shannon-Fano algorithm   B) ASK   C) FSK   D) Digital modulation

35. The expected information contained in a message is called   [   ]
    A) Entropy   B) Efficiency   C) Coded signal   D) None of the above

36. Code rate r, k information bits and n as total bits, is defined as   [   ]
    A) r = k/n   B) k = n/r   C) r = k * n   D) n = r * k

37. The channel capacity according to Shannon's equation is   [   ]
    A) Maximum error free communication   B) Defined for optimum system
    C) Information transmitted   D) All of the above

38. Information rate is defined as   [   ]
    A) Information per unit time   B) Average number of bits of information per second
    C) rH   D) All of the above

39. The relation between entropy and mutual information is   [   ]
    A) I(X;Y) = H(X) - H(X/Y)   B) I(X;Y) = H(X/Y) - H(Y/X)
    C) I(X;Y) = H(X) - H(Y)   D) d. I(X;Y) = H(Y) - H(X)

40. Entropy is   [   ]
    A) Average information per message   B) Information in a signal
    C) Amplitude of signal   D) All of the above