B.Tech. || ECE || Semester III
Analog Communication Engineering
Subject Code: ECL 2151

Time allowed: 01:30 Hrs

Max Marks: 20

Important Instructions:
- Attempt all questions
- Assume any missing data
- The answer should be precise and point to point.

Section - A

Q. 1.   Answer the following:

A. VoIP Internet telephony was invented: [1]
   a) 1998
   b) 2000
   c) 2003
   d) 2002

B. A function of one or more variables which convey the information on the   [1]
   nature of the physical phenomenon is called_____

C. Comment on guided media vs unguided media.   [2]

D. What is the mathematical expression of the additive noise channel?   [1]

E. What is the range of data rate that is supported by cellular radio?   [1]

Section – B

Q. 2.   Explain the following with illustration: [6]
   1. CT ramp signal Vs CT unit step.
   2. Channel impairments.
   3. Requirements of communication systems.
   4. Complex exponential signal

Q. 3   Enlighten the elementary components of the communication system with its   [4]
   pictorial representation and example.

Q. 4.   Brief the historical development of the communication system.   [4]

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Section - A

Q. 1.   Answer the following:

A.   Noise is added to a signal in a communication system: [1]

    a)   At the receiving end

    b)   At transmitting antenna

    c)   In the channel

    d)   During regeneration of the information

B.   Which mathematical notation specifies the condition of periodicity for a   [1]
    discrete-time signal?

    a) $x(t) = x(t + T0)$

    b) $x(n) = x(n + N)$

    c) $x(t) = e-\alpha t$

    d)   None of the above

C.   A function of one or more variables which convey the information on the   [2]
    nature of the physical phenomenon is called ___Signal___

D. $Y(t) = x(2.5t)$ is _____   [1]

    a)   Compressed signal

    b)   Expanded signal

    c)   Shifted signal

    d)   Amplitude scaled signal by a factor of 2.5

E.   List the unique features of wireless media   [2]

F.   What is the mathematical expression of the linear filter channels with   [2]
    additive noise?

G.   Which of the following is not true about the ramp function?   [1]

    a) $r(t) = t\, u(t)$

    b)   Ramp function with unit slope is integral of unit step

    c)   Integral of unit step is a ramp function of unit slope

    d)

$$r(t) = \begin{cases} t, & t \geq 0 \\ 0, & t < 0 \end{cases}$$

Section - B

Q. 2 Classify the various kinds of signals with proper explanation. [5

Q. 3. Explain each and every key element of the communication system with its [5
pictorial representation and example.

Q. 4. Explain the various basic possible operations that may be performed on the [6
signal. What is the type of the following given system in terms of linearity,
time-variant, and stability? $y(t) = x(t-5) - x(3-t)$.

Q. 5. What do you mean by channel impairment and also list the various type of it [4]
with short description?

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Section - A

Q.1. Answer the following:

A. Power signal can also be of finite duration.   [1]
    a. True, b. False

B. SSB-SC and VSB-SC both modulation can be used for both voice and   [1]
    video communication.
    a. True, b. False

C. AM is the least power efficient among DSB-SC, SSB-SC and VSB-SC   [1]
    modulations.
    a. True, b. False

D. A Pulse Modulated (PM) signal can be generated by passing the message   [1]
    signal to a differentiator circuit followed by a FM modulator.
    a. True, b. False

E. Amplitude changes constant in a frequency modulated (FM) signal.   [1]
    a. True, b. False

Section – B

Q.2. The output of an AM is given as: [8]
$y(t) = 8 \cos(1800\pi t) + 32 \cos(2000\pi t) + 8 \cos(2200\pi t)$. If the signal is
expressed as: $y(t) = A (1 + \mu \cos(2\pi f_m t)) \cos(2\pi f_c t)$, Note that, f_m is the
bandwidth of the baseband signal while f_c is the
frequency of the carrier. Find the following: 1. fm, fc., 2. Modulation index μ
and amplitude of the carrier A, 3. Power efficiency. 4. Career power.

Q.3 Do the time and frequency domain analysis of the AM signal with its pictorial   [8]
representation. Also, derive the square law demodulation scheme with
graphical representation.

Q.4. A 100 MHz carrier is frequency modulated by a sinusoidal signal of amplitude   [6]
20V and frequency 100K Hz. The frequency sensitivity of the modulator is
25K Hz/volt. Determine i) frequency deviation ii) modulation index (β) iii)
bandwidth.

1

$2 \cos A \cdot \cos B = \cos(A + B) + \cos(A - B)$

Q.5. Derive the expression for single tone frequency modulated signal.

Q.6. Explain the following:
- Need for modulation in communication systems.
- Advantages of SSBSC over DSBSC, AM.
- Define Carson's rule for bandwidth of FM systems.
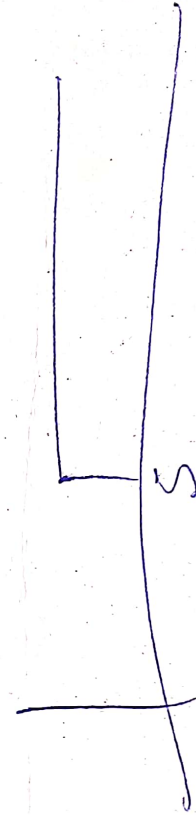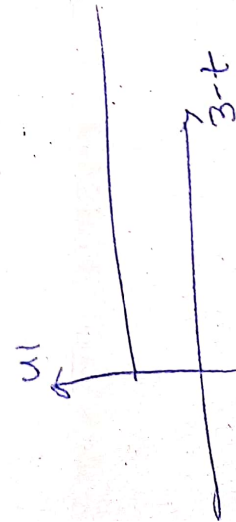- Compare NBFM and WBFM.
- Compare the noise performance of FM and AM systems.

Q.7. Explain the various basic possible operations that may be performed on the signal. What is the type of the following given system in terms of linearity, time-variant, and stability? $y(t) = x(t-5) - x(3-t)$.

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

Exam: Minor-II, Session: July to December 2022

Entry No:

B.Tech. || ECE || Semester III
Analog Communication Engineering
Subjet Code: ECL 2151

Time allowed: 01:30 Hrs   Max Marks: 20

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Section - A

Q.1.   Answer the following:

A. Y (t) = x (3.5t) is _____   [1]
   a) Compressed signal
   b) Expanded signal
   c) Shifted signal
   d) Amplitude scaled signal by a factor of 3.5

B. Power of energy signal is always zero.   [1]
   a. True,   b.   False

C. List the significance of the modulation technique in communication.   [2]

D. DSB-SC modulation is the least bandwidth efficient among DSB-SC,   [1]
   SSB-SC and VSB-SC modulations.
   a. True,   b. False

Section – B

Q.2.   The output of an Amplitude Modulated (AM) is given as: [6]
$y(t) = 8 \cos(3600\pi t) + 32 \cos(4000\pi t) + 8 \cos(4400\pi t)$. If the signal is
expressed as: $y(t) = A (1 + \mu \cos(2\pi fmt)) \cos(2\pi fct)$, Note that, fm is the
bandwidth of the baseband signal while fc is the
frequency of the carrier. Find the following:
   1. fm, fc., 2. Modulation index μ and amplitude of the carrier A, 3. Power
   efficiency.

Q.3   If the μ of AM wave is increased from 0 to 1, the transmitted power will be   [3]
   increased or decreased by what percentage, justify the your answer.

Q.4.   Do the time and frequency domain analysis of the DSB-SC signal with its   [4]
   pictorial representation.

Q.5.   In AM, the modulation envelope has a peak value which is 2.5 times the   [2]
   unmodulated carrier value. What is the modulation index?