September 2021

ELEMENTARY COMMUNICATION ENGINEERING

Time Allowed: 1.5 Hours *Full Marks: 70*

Answer to Question No.1 is compulsory and Answer <u>any two</u> questions from the rest.

1. Answer the following questions (any twenty): 2x20

i) The significant sidebands of FM are determined from – a) Fourier transform, b) Laplace transform, c) Bessel function, d) Odd function.

ii) The example of simplex communication is – a) radio, b) walky talky, c)Mobile, d) both a and b.

iii) Hybrid network is a – a) two wire circuit into four wire circuit, b) Four wire circuit into four wire circuit, c) two wire circuit into two wire circuit, d) four wire circuit into four wire circuit.

iv) Image frequency in a super heterodyne receiver is given by – a) fs+fi, b) fs+2fi, c) fs-fi, d) fs-2fi.

v) The word varactor stands for –
a) variable resistor, b) variable reactor, c) variable oscillator, (d) None.

vi) Voice frequency range associated with – a) 20Hz to 20KHz, b) 300Hz to 3.3KHz, c) 30Hz to 3KHz, d) 30Hz to 300KHz.

vii) VCO is used to generate – a) Direct FM, b) Indirect FM, c) SSB-SC, d) DSB-SC.

viii) One method of SSB signal generation is – a) phase shift, b) balanced modulator, c) varacter diode, d) Armstrong method.

ix) PWM can be generated from – a) mono-stable multivibrator, b) bistable multivibrator, c) astable multivibrator, d) none.

x) In PCM, if lowest voltage level is -2V and highest voltage level 4V, and a 2bit quantizer use then the step size is – a) 1.5V, b) 1.3V, c) 2.5V, d) 2.3V.

xi) The pre-emphasis circuit provides extra noise immunity by – a) boosting the bass frequencies, b) amplifying the higher audio frequencies, c) pre-amplifying the whole audio band, d) converting the phase modulation to FM.

xii) Slope overload error eliminated by using – a) Pulse code modulation, b) Delta modulation, c) Adaptive delta modulation, d) All of the above.

xiii) Central office connected by – a) local loop, b) trunk lines, c) both a & b, d) none of the above.

xiv) In a mixer circuit – a) Frequency of two signals are subtracted, b) amplitude of two signal are subtracted, c) amplitude of two signal are added, d) None.

xv) Essential circuit for PAM generation is – a) Balance Modulator, b) Class-C amplifier, c) Sample and hold circuit, d) None.

xvi) In PCM a system, the quantization noise depends upon – a)the number of quantization levels only, b)the sampling rate only, c)both the sampling rate and the number of quantization levels, d)none of the above is correct.

xvii) Calculate the bandwidth of a DSB signal when the modulating frequency lies in the range of 100Hz to 10KHz _____.(19.8KHz/20KHz).

xviii) The digital transmission which required minimum bandwidth is_____.(DM/PCM)

xix) If modulating frequency is 25Khz and frequency deviation is 175kHz, then modulation index is_____(7/0.7)

xx) A sinusoidal voltage of amplitude 1kV is amplitude modulated by another sinusoidal voltage to produced 30% modulation. The amplitude of each sideband term is _____(300V/150V)

xxi) Inter Symbol Interference is the problems in_____(PCM/PM)

xxii) TV channel bandwidth is_____(7MHz/7KHz)

xxiii) The required bandwidth according to the Carson's rule, when a 100 MHz carrier is modulated with a sinusoidal signal at 1KHz, the maximum frequency deviation being 50 KHz is_____(102KHz/101KHz)

xxiv) A wavelength of 15 meters corresponding to a frequency of _____. (20MHz/200MHz/2MHz)

xxv) The power in sideband in case of AM is – a) $1/2^{th}$, b) $1/4^{th}$, c) $1/8^{th}$, d) $1/3^{th}$ the power of carrier signal.

2. a) Define sampling. Explain different sampling technique.
   b) Explain the PWM generation technique with Diagram. (3+5+7)

3. a) Draw the Block diagram the FM transmitter and write the various features of FM transmitter.
   b) Write the disadvantage of filter method of SSB generation. To recover this disadvantage which type of SSB generation we used. Explain it with diagram (6+3+6)

4. a) Explain the operation of limiter with the help of diagram.
   b) Explain Foster-Seeley discriminator with proper diagram. (7+8)

5. a) Draw the block diagram of super heterodyne receive and briefly explain the function of IF stage
   b) Find the image frequency of an AM receiver with 455 kHz IF and tuned to a station at 845 kHz. Define one important characteristics of radio receiver. (5+3)+(5+2)

6. a) Define local loop. Write the basic function of telephone exchange. Write the significance of side tone in a telephone conversation.
   b) Explain the function of hook switch in a telephone exchange. (3+3+3)+6

7. a) Explain ISI. What is aliasing error? How to remove this error?
   b) With diagram about BI-POLAR (both RZ and NRZ) and AMI coding, Manchester coding format using 110010101 format. (5+3+3)+4

8. a) Write the advantage and disadvantage of PCM system.
   b) With proper explanation discus the used of linear and non-linear quantization (7.5+7.5)

9. Explain the diagram of Delta modulation transmitter and receiver. What is the different between delta and adaptive delta modulation? (8+7)

10. a) Define frequency spectrum. Classify different time of communication system according to the transmission mode.
    b) Explain the need of modulation. (3+5+7)

11. a) Define frequency deviation in FM. Explain Carson's rule in narrowband and wideband FM.
b) What is DSB-SC? Write the advantage of SSB-SC over DSB-SC. Define percentage modulation in case of AM. (3+5)+(3+3+1)