Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

SCHOOL OF ENGINEERING

MAKE UP EXAMINATION – JAN 2023

Course Code: ECE 212

Course Name: Digital Communication

Programme: ECE

Date: 28-JAN-2023

Time: 01.00PM to 04.00PM

Max Marks: 100

Weightage: 50%

Part A [Memory Recall Questions]

Answer all Questions. Each question carries TWO mark. (20Qx2M=40M)

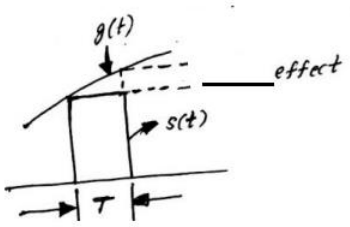
1. Source encoding and channel encoding are vital parts in digital communication system. Here main purpose of source encoding is to _____the digital signal, and channel encoder is used to identify _____and correct it. (C.O.NO.3) [B.Level: Knowledge]
2. Sampling of analog signals is done to convert a signal into discrete samples in time. Identify the following conditions with respect to sampling theorem. (C.O.NO.1) [B.Level: Knowledge]

   Ws<2W - _____ sampling

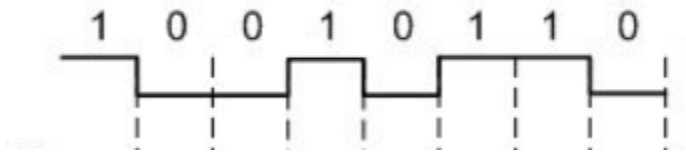
   Ws=2W - _____sampling

   Ws>2W- _____ sampling
3. Quadrature-sampling is the process of digitizing a continuous (analog) band pass signal and translating its spectrum to be centered at zero Hz. In quadrature sampling of band pass signals, the band pass signals are represented in terms of _____ component and _____component. (C.O.NO.3) [B.Level: Knowledge]

4. In the given figure below _____is the sampling type and _____is the effect caused to this sampling type. (C.O.NO.2) [B.Level: Knowledge]



5. Time-division multiplexing (TDM) is a method of putting multiple data streams in a single signal by separating the signal into many segments. In Time division multiplexing _____ and _____ at transmitter and receiver are the elements which are the implemented using electronic switching system. (C.O.NO.2) [B.Level: Knowledge]
6. If the signal space diagram of digital modulation technique has 2 energy points, one message point has √Eb and zero, the modulation scheme is ___. (C.O.NO.3) [B.Level: Knowledge]
7. Coherence in communication refers to a logic and consistency of the message. _____scheme of modulation eliminates the need for coherent reference signal at the receiver. (C.O.NO.3) [B.Level: Knowledge]
8. Quadrature Phase Shift Keying (QPSK) is a form of Phase Shift Keying in which two bits are modulated at once. In QPSK two sequences b1 (t) and b2(t) phase modulate two carrier signals of same frequency but _____in phase. (C.O.NO.3) [B.Level: Knowledge]
9. Given below is a binary sequence, with a suitable carrier wave draw the waveform representing PSK method of modulation. (C.O.NO.2) [B.Level: Knowledge]



10. Companding refers to a technique for compressing and then expanding an analog or digital signal. The two types of companding are__law and__law. (C.O.NO.3) [B.Level: Knowledge]

11. Pulse modulation is a type of modulation in which the signal is transmitted in the form of pulses. DPCM is a technique_____. (C.O.NO.2) [B.Level: Knowledge]
    a) To convert analog signal into digital signal
    b) Where difference between successive samples of the analog signals are encoded into n-bit data streams
    c) Where digital codes are the quantized values of the predicted value
    d) all of the above (C.O.NO.4) [B.Level: Knowledge]
12. Quantization is the process of mapping continuous infinite values to a smaller set of discrete finite values. The step size Δ is given by _____. (C.O.NO.3) [B.Level: Knowledge]
13. A delta modulation (DM or Δ-modulation) is an analog-to-digital and digital-to-analog signal conversion technique used for transmission of voice information where quality is not of primary importance. ___ and___noises present in delta modulation. (C.O.NO.3) [B.Level: Knowledge]
14. DPCM in pulse modulation is a type of PCM. DPCM encodes the PCM values based on
    a) Quantization level
    b) Difference between the current and predicted value
    c) Interval between levels
    d) None of the mentioned (C.O.NO.3) [B.Level: Knowledge]
15. Spread spectrum is a form of wireless communications in which the frequency of the transmitted signal is deliberately varied. Which of the following is not a property of spread spectrum techniques?
    a) Interference rejection capability
    b) Multipath fading
    c) Frequency planning elimination
    d) Multiple user, multiple access interface (C.O.NO.4) [B.Level: Knowledge]

16. Spread spectrum is normally developed for secure communication. The PN sequence used in spread spectrum is noise like ____code and is usually ____in nature.
    (C.O.NO.4) [B.Level: Knowledge]

17. FHSS transmission is the repeated switching of the carrier frequency during radio transmission to reduce interference and avoid interception. _____type of FHSS requires high bandwidth and _____requires low bandwidth.

a) Slow, Fast
b) Slow, Very slow
c) Fast, very fast
d) Fast, Slow (C.O.NO.4) [B.Level: Knowledge]

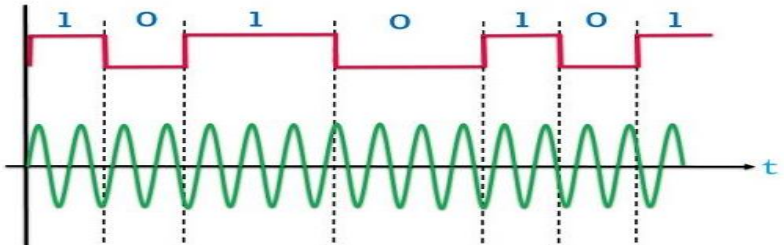
18. In telecommunications, direct-sequence spread spectrum (DSSS) is a spread-spectrum modulation technique primarily used to reduce overall signal interference. In DSSS the bandwidth of spread spectrum signal is equal to the bandwidth of _____ signal and N times the bandwidth of _____ signal.

a) Information, carrier
b) PN sequence, Information
c) FHSS, Information
d) Sampling, PN sequence (C.O.NO.4) [B.Level: Knowledge]

19. SNR is defined as the ratio of signal power to the noise power, often expressed in decibels. The equation for SNR (db) in case of non-sinusoidal signal is _____.

(C.O.NO.2) [B.Level: Knowledge]

20. Given below is a binary sequence and carrier. Draw the waveform representing ASK method of digital modulation. (C.O.NO.3) [B.Level: Knowledge]



Part B [Thought Provoking Questions]

Answer all Questions. Each question carries TEN marks. (3Qx10M=30M)

21. In digital communication, the digital data is mirrored through variations in frequency of a carrier. Amplitude and Phase continue to be constant. Identify the Digital modulation technique and explain with neat diagrams,equations and signal space diagram for the same. (C.O.NO 3) [B.level: Comprehension]
22. Identify the type of PCM where the present sample is compared with previous sample and working principle depends on prediction. Explain the transmitter and receiver diagram with relevant equations and waveforms. (C.O.NO 2) [B.level: Comprehension]
23. With a neat diagram and waveforms, explain the type of spread spectrum where data being transmitted is multiplied by a pseudorandom spreading sequence and phase shift keying before transmission at the transmitter. (C.O.NO 4) [B.level: Comprehension]

Part C [Problem Solving Questions]

Answer all Questions. Each Question carries TEN marks. (3Qx10M=30M)

24. A binary data stream $\{b_k\}$ 10010011 is to be transmitted using DPSK.The initial differentialy encoded bit d_{k-1} is 1. Obtain the differentially encoded sequence $\{d_k\}$.
    i) Give the corresponding phase and polarity of transmitted carrier.
    ii) Give the polarity of the signal sample
    iii) Give the decision rule and the corresponding detected sequence $\{b_k\}$.

    (C.O.NO 3) [B.level: Application]

25. If 8 bit PCM is used for speech signal ranging up to 1v calculate (C.O.NO 2) [B.level: Application]
    a. The resolution and quantization error
    b. Minimum Line speed
    c. Coding efficiency for a resolution of 0.01v

26. A spread spectrum communication system is characterized by the following parameters:
    Duration of each information bit, T_b=4.095ms.
    Chip duration of a PN sequence, T_c=1μs.
    Determine the processing gain and jamming margin if (E_b/N_o)=10 and the average probability of error $P_e=0.5x10^{-5}$. (C.O.NO 4) [B.level: Application]