

KATHMANDU UNIVERSITY
End Semester Examination
January/February 2024

Level : B.E.
Year : III
Time : 2 hrs. 30mins.

Course : ETEG 320
Semester : I
F. M. : 40

22 JAN 2024

SECTION "B"
[4 Q × 10 = 40 marks]

Attempt *ANY FOUR* questions. Missing data may be suitably assumed. Each symbol carries their usual meaning.

1.
 - a. What are the advantages of digital communication system over analog communication system? [3]
 - b. State the sampling theorem and explain its significance in pulse modulation. [4]
 - c. Draw the FSK, BPSK and QPSK waveform for the bits stream 10011100. [3]
2.
 - a. Considering single tone modulation, derive time domain and frequency domain expression for AM wave and draw its spectrum. [3]
 - b. Explain the working of delta modulation. How adaptive delta modulation improves the performance of delta modulation? [4]
 - c. Explain the working mechanism of QPSK modulation with suitable diagram. [3]
3.
 - a. With a necessary block diagram and necessary equations explain NBFM generation method. [4]
 - b. A discrete memory-less source X has five symbols (s_0, s_1, s_2, s_3, s_4) and their probabilities of occurrence are given as 0.40, 0.20, 0.20, 0.10, 0.10, respectively. Construct Huffman code and calculate efficiency. [3]
 - c. Explain T-1 carrier system with the help of frame diagram. [3]
4.
 - a. Explain the significance of optimal filter in communication system with suitable example. [4]
 - b. What are the advantage and disadvantage of cyclic code? Determine all the code words for following given cyclic code parameters, [6]
 $g(x) = 1 + x^2 + x^3 + x^4, \quad C = [7, 3].$
5. A convolutional coding system is described by following parameters, [3+7=10]
 $L = 3, n = 3, M = 4, g_1 = [1 \ 0 \ 0] \quad g_2 = [1 \ 0 \ 1] \quad g_3 = [1 \ 1 \ 1]$
 - i. Draw the encoder
 - ii. Draw the state transition diagram from the given parameters

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Registration No.:

Date :

SECTION "A"

[20Q. \times 0.5 = 10 marks]

Choose and encircle in the most appropriate option from each set of choices

- On modulating a carrier of frequency f_c by and audio signal f_s , the following components have resulted: f_c , $f_c + f_s$, $f_c - f_s$. What is the type of modulation likely to be?
 - Amplitude modulation
 - Single side band modulation
 - Frequency modulation
 - Vestigial sideband modulation
- Which one of the following blocks is not common in both AM and FM Receiver?
 - RF amplifier
 - Mixer
 - IF amplifier
 - Slope detector
- A carrier wave of amplitude 100 V is amplitude modulated by an audio signal to produce 30% AM. What is the amplitude of the side band?
 - 0.15 kV
 - 1 kV
 - 1.5 kV
 - 3 kV
- The major advantage of FM over AM is _____.
 - reception is less noisy
 - higher carrier frequency
 - smaller bandwidth
 - small frequency deviation
- The frequency deviation produced in a VHF carrier by a signal of 100 Hz is 50 kHz. The frequency modulation index is _____.
 - 100 radians
 - 250 radians
 - 500 radians
 - 750 radians
- In FM, when the modulation index increases, the transmitted power will _____.
 - increases
 - decreases
 - unchanged
 - equal to AM
- If the noise figure of a device is 2 and input SNR is 37 dB, what would be output SNR?
 - 18.5 dB
 - 34 dB
 - 40 dB
 - 74 dB
- The noise generated in system due to random behavior of charge carriers is known as _____.
 - shot noise
 - industrial noise
 - white noise
 - flicker noise
- Example of continuous wave analog modulation is _____.
 - PCM
 - DM
 - AM
 - PAM
- _____ is also known as slope detection.
 - Square law demodulation
 - Coherent demodulation
 - FM to AM conversion
 - Non coherent demodulation

11. In Delta modulation, the slope overload distortion can be minimized by _____.
- decreasing the step size
 - keeping the step size constant
 - keeping the step size zero
 - increasing the step size
12. Disadvantage of PCM is _____.
- high signal to noise ratio
 - high bit rate for short distance
 - high bandwidth
 - high power requirement
13. Which of the following pairs shares same bandwidth?
- ASK and FSK
 - ASK and PSK
 - FSK and PSK
 - ASK and QPSK
14. Which modulation scheme will have minimal BER?
- QPSK
 - 8-PSK
 - 16-PSK
 - 16-QAM
15. To increase the rate of communication by $\log_2 M$ in M-array communication, the power requirement increased by _____.
- 2^M
 - M^2
 - M^M
 - $2M$
16. Which of the following cannot be the valid code word in the same group? If one of the code word 0001011 of (7, 4) block code having the error correction capacity is given.
- 0011101
 - 0101100
 - 0011010
 - 1110100
17. Which of the following is **TRUE** when the sampling time becomes less than the Nyquist interval?
- Original signal can be recreated
 - Bandwidth decreases
 - Bandwidth increases
 - Channel capacity decreases
18. A signal of maximum frequency of 10 kHz is sampled at Nyquist rate. The time interval between two successive samples is _____.
- 50 μ s
 - 100 μ s
 - 500 μ s
 - 1000 μ s
19. In digital communication system, smaller code rate is the indicator of _____ number of redundant bits.
- less
 - high
 - unknown
 - infinite
20. The efficiency of the Huffman code is linearly proportional to _____.
- average length of code
 - maximum length of code
 - average entropy
 - average power of bits