Marks Scored:

KATHMANDU UNIVERSITY
End semester Examination
August, 2018

Level : B. E.
Year : III
Course : ETEG 304
Semester : II
Exam Roll No. :
Time: 30 mins .
F. M. : 10
Registration No.:
Date AUG 20 2018

SECTION "A"
[20 Q.× 0.5= 10 marks]

Tick (√) the appropriate answer.

1. Which signal component gets more attenuation during transmission?
   a) Low frequency component
   b) High frequency component
   c) Low & High both frequency component
   d) Phase component

2. In PCM encoding, quantization level varies as a function of _____.
   a) frequency
   b) amplitude
   c) square of frequency
   d) square of amplitude

3. Adaptive DPCM is used to _____.
   a) increase bandwidth
   b) decrease bandwidth
   c) increase SNR
   d) decrease system complexity

4. Uniform quantization provides better quantization for _____.
   a) weak signals
   b) strong signals
   c) weak & strong signals
   d) audio signals

5. Which value of μ corresponds to linear amplification?
   a) $\mu = 0$
   b) $\mu = 1$
   c) $\mu > 0$
   d) $\mu < 0$

6. In which waveform logic 1 is represented by equal amplitude alternating pulses?
   a) Unipolar RZ
   b) Bipolar RZ
   c) RZ-AMI
   d) Manchester coding

7. Which waveform has the feature of error detection?
   a) NRZ-L
   b) RZ-AMI
   c) Manchester coding
   d) Duobinary

8. Performance of BFSK signal is _____ than BPSK.
   a) 3dB worse
   b) 3dB better
   c) 6dB worse
   d) 6dB better

9. Matched filter is used for _____.
   a) coherent detection
   b) non coherent detection
   c) coherent & non coherent detection
   d) coherent transmission

10. Energy per symbol Es is given as_____.
   a) Es = Eb (log2M)
   b) Es = Eb / (log2M)
   c) Es = 2 Eb (log2M)
   d) Es = Eb / 2(log2M)

11. Every frequency has _____ orthogonal functions.
a) one b) two c) four d) six

12. Increased pulse width in the flat top sampling leads to _____.
a) attenuation of high frequencies in reproduction
b) attenuation of low frequencies in reproduction
c) greater aliasing errors in reproduction
d) no harmful effects in reproduction

13. A signal $x(t) = 100\cos(24\pi \times 10^3)\, t$ is ideally sampled with a sampling period of 50 μsec and then passed through an ideal low pass filter with cutoff frequency of 15 KHz. Which of the following frequency is/are present at the filter output?
a) 12 KHz only b) 8 KHz only
c) 12 KHz and 9 KHz d) 12 KHz and 8 KHz

14. The peak to peak input to a 8 bit PCM coder is 2 volt. The signal power to quantization noise power ratio (in dB) for an input of $0.5\cos\omega_m t$ is_____.
a) 47.8 b) 43.8 c) 95.6 d) 99.6

15. An analog signal is band-limited to 4 KHz, sampled at the Nyquist rate and the samples levels are assumed to be independent and equally probable. If we transmit two quantized samples per second, the information rate is _____.
a) 1 bit/sec b) 2 bits/sec c) 3 bits/sec d) 4 bits/sec

16. In a BPSK signal detector, the local oscillator has a fixed phase error of $20^0$ .This phase error deteriorates the SNR at the output by a factor of _____.
a) $\cos 20^0$ b) $\cos^2 20^0$ c) $\cos 70^0$ d) $\cos^2 70^0$

17. A video transmission system transmits 625 picture frames per second. Each frame consists of a 400 x 400 pixel grid with 32 intensity levels per pixel. The data rate of the system is _____.
a) 16 Mbps b) 500 Mbps c) 600 Mbps d) 3.2 Gbps

18. The input to a matched filter is given by $s(t) = \begin{cases} 10\sin(2\pi \times 10^6) & 0 < t < 10^{-4} \text{ sec} \\ 0 & \text{Otherwise} \end{cases}$

The peak amplitude of the filter output is _____.
a) 10 volts b) 5 volts c) 10 millivolts d) 5 millivolts

19. The maximum permissible distance between two samples of a10KHz signal is_____.
a) 100 μ s b) 50 μ s c) 100 d) 20

20. A source delivers symbols m1, m2, m3 and m4 with probability 1/2, 1/4, 1/8 and 1/8 respectively. The entropy of the system is _____.
a) 1.85 bits/symbol b) 1.75 bits/symbol
c) 1.85 symbols/sec d) 1.75 symbols/sec

KATHMANDU UNIVERSITY
End semester Examination
August, 2018



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

Course : ETEG 304
Semester : II
F.M. : 40

SECTION "B"
[4Q × 10 = 40 marks]

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

1. a. Why digitisation of information is needed? Why is it considered important? [2+2]
   b. What is the difference between ideal sampling and pulse sampling? Why to use ideal and flat top sampling? how can sampling is affected in practice? [1.5+1.5+1]
   c. A certain code has value of n = 7 and k = 3. Comments on its error correction and error detection capabilities with the help of suitable example. [2]

2. a. How is Delta Modulation different from PCM? Explain in detail. [4]
   b. A delta modulator is to be designed to tramsmit the information of an analog waveform that has peak to peak level of 1 V and a bandwidth of 3.4 kHz. Assume that the waveform is to be transmitted ovear a channel whose frequency response is extremely poor above 1 MHz. Select the appropriate step size and sampling rate for a sine wave test signal and discuss the performance of the system, using the parameter values you have selected. [6]

3. a. Estimate the information per letter in the English language key board, assuming that each character is independent of the others. [3+3]
      i. Assume that all 27 characters (26 letters and a space) are equiprobable.
      ii. Assume that the probabilities of 27 characters are not equiprobable.
   b. Show that the probability of error in a QPSK system is greater than that for a BPSK system for transmitting the same amount of signal energy. [4]

4. a. Assume a (6, 2) code generated by the matrix, $G = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 \\ 0 & 1 & 1 & 0 & 1 & 1 \end{bmatrix}$ [5]
      i. Construct the code table for this code and determine the minimum distance between codewords.
      ii. If the received word is 110110, determine the transmitted data word.
   b. What do you understand by error control coding? Explain the working principle of convolution encoder with example. [5]

5. a. A Sinusoidal signal with a maximum peak input voltage of 5V is applied to a PCM channel using a 10-bit code word. Find (i) the number of quantization levels used, (ii) Maximum SNR in dB. [6]
   b. Describe coherent detection of QAM signal with appropriate block diagram. [4]