KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B.E.
Year : III

Course : ETEG 302
Semester : I

Exam. Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date : FEB 2 7 2019

SECTION "A"
[20 Q. × 0.5 = 10 marks]

Choose and encircle the most appropriate answer among the given choices.

1. In a communication system, noise is most likely to affect the signal
   a. at the receiver
   b. at the transmitter
   c. at the information source
   d. in the channel

2. In modulation, "carrier" is
   a. resultant wave
   b. speech voltage to be transmitted
   c. voltage with constant frequency, phase or amplitude
   d. voltage for which frequency, phase or amplitude is varied

3. Fourier analysis indicates that a square wave can be represented as
   a. a fundamental sine wave and odd harmonics
   b. a fundamental sine wave and even harmonics
   c. a fundamental sine wave and harmonics
   d. fundamental and subharmonic sine waves

4. A telephone channel requires a bandwidth of about
   a. 1 kHz b. 3 kHz c. 10 kHz d. 50 kHz

5. The bandwidth required for amplitude modulation is
   a. half the frequency of modulating signal
   b. equal to the frequency of modulating signal
   c. twice the frequency of modulating signal
   d. four times the frequency of modulating signal

6. The intermediate frequency in a standard AM receiver is
   a. 455 Hz b. 455 kHz c.107 kHz d. 10.7 MHz

7. What is the maximum transmission efficiency of an AM signal?
   a. 64.44% b. 33.33% c. 56.66% d. 75.55%

8. Which of the following is an advantage of SSB over DSB?
   a. No change in spectrum space
   b. Reduce in spectrum space
   c. Carrier is suppressed
   d. Power is not wasted on the carrier

9. The modulation index of FM is given by
   a. μ = frequency deviation/ modulating frequency
   b. μ = modulating frequency /frequency deviation
   c. μ = modulating frequency/ carrier frequency
   d. μ = carrier frequency / modulating frequency

10. The modulation index of an AM wave is changed from 0 to 1. The transmitted power is
    a. unchanged
    b. halved
    c. doubled
    d. increase by 50 percent

11. VSB modulation is preferred in TV because
    a. it reduces the bandwidth requirement to half
    b. it avoids phase distortion at low frequencies
    c. it results in better reception
    d. Both b. and c.

12. Which of the following is an indirect way of generating FM?
    a. Armstrong modulator
    b. Varactor diode modulator
    c. Reactance FET modulator
    d. Reactance bipolar transistor

13. Commercial Frequency deviation of FM is
    a. 70 kHz
    b. 75 kHz
    c. 80 kHz
    d. 65 kHz

14. A pre-emphasis circuit
    a. boosts base frequencies
    b. pre amplifies the complete audio band
    c. amplifies higher audio frequencies
    d. converts FM into phase modulation

15. In a FM signal, the modulation index increases, then the power
    a. increases
    b. decreases
    c. remains constant
    d. none of the above

16. In terms of signal frequency (f_s) and intermediate frequency (f_i), the image frequency is given by
    a. $f_s + f_i$
    b. $f_s + 2f_i$
    c. $2f_s + f_i$
    d. $2(f_s + f_i)$

17. What is 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.
    a. 1 KHz
    b. 50 KHz
    c. 102 KHz
    d. 150 KHz

18. In an FM stereo multiplex transmission, the
    a. sum signal modulates 19 kHz subcarrier
    b. difference signal modulates the 19 kHz subcarrier
    c. difference signal modulates the 38 kHz subcarrier
    d. difference signal modulates the 67 kHz subcarrier

19. Interlacing is used in television to
    a. produce the illusion of motion
    b. ensure that all the lines on the screen are scanned, not merely the alternate ones
    c. simplify the vertical sync pulse train
    d. avoid flicker

20. In television, 4:3 represents the
    a. interlace ratio
    b. maximum horizontal deflection
    c. aspect ratio
    d. ratio of the two diagonals

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SECTION "C"
[5 Q. × 8 = 40 marks]

Attempt *ANY FIVE* questions. Symbols and abbreviations have usual meanings. Assume suitable values for missing data.

1.
a. Suppose the following message is transmitted using DSB modulation
$$m(t) = 2cos(10\pi t) + cos(20\pi t)$$
Draw the spectrum of the DSB modulated signal, identify the upper and lower sidebands. [3]
b. Describe the FM stereo system and mono system. [3]
c. With the help of circuit diagram explain the operation of envelope detector for AM. [2]

2.
a. Explain the noise performance of FM systems. [3]
b. Compare AM with DSB-SC and SSB-SC. [2]
c. Explain any one method of FM demodulation. [3]

3.
a. Explain VSB modulation with its applications. [3]
b. Derive an expression of efficiency η of standard AM and show that for a single tone AM $\eta_{max} = 33.3\ \%$ for $\mu = 1$. [5]

4.
a. Classify and explain various types of noise that affect communication. [3]
b. Distinguish between baseband communication and carrier communication. [2]
c. Draw the Amplitude Modulation waveforms with modulation index $(m) = 1$, $m > 1$ and $m < 1$. [3]

5.
a. Describe pre-emphasis and de-emphasis in FM. [3]
b. Explain the operation of super-heterodyne receiver with relevant block diagram. [3]
c. A sinusoidal modulating waveform of amplitude 5 V and a frequency of 2 KHz is applied to FM generator, which has a frequency sensitivity of 40 Hz/volt. Calculate the frequency deviation and modulation index. [2]

6.
a. Using Hilbert Transform, derive an equation for SSB signals with only USB and rejecting LSB. [4]
b. Differentiate positive and negative modulation in TV. [2]
c. When the modulation percentage is 75%, an AM transmitter radiates 10KW Power. How much of this is carrier Power? [2]