Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(CSE/IT)(OLD)/SEM-4/EC-411/2012

2012

PRINCIPLES OF COMMUNICATION ENGINEERING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) The high frequency range extends from

a) 300 kHz - 3000 kHz b) 3 MHz - 30 MHz

c) 30 MHz - 300 MHz d) 300 MHz - 3000 MHz.

ii) The function of the input transducer in a communication system is

a) to transmit the message signal

b) to modulate the message signal

c) to convert message sound signal into electrical signal

d) none of these.

iii) The positive RF peaks of an AM voltage rise to a maximum value of 12V drop to a minimum value of 4V. The modulation index assuming single tone modulation is

a) 3 b) $\frac{1}{3}$

c) $\frac{1}{4}$ d) $\frac{1}{2}$.

iv) The main advantage of super-heterodyne receiver is

a) simple circuit

b) better tracking

c) improvement in selectivity & sensitivity

d) better alignment.

v) The resonant frequency of an RF amplifier is 1 MHz and its bandwidth is 10 kHz. The *Q* factor will be

a) 10 b) 100

c) 0·01 d) 0·1.

vi) Armstrong FM transmitter performs frequency multiplication in stages

a) to increase the overall S/N ratio

b) to reduce bandwidth

c) to find the desired value of carrier frequency as well as frequency deviation

d) for convenience.

vii) Bandwidth of a single tone WBFM, given by Carson's Rule is

a) $\Delta w + w_m$ b) $2(\Delta w + w_m)$

c) $2\Delta w$ d) $2w_m$.

viii) Which of the following modulations is digital in nature ?

a) PAM b) PPM

c) DM d) AM.

ix) A super-heterodyne receiver with an IF of 450 kHz is tuned to a signal at 1200 kHz. The image frequency is

a) 750 kHz b) 1650 kHz

c) 2100 kHz d) 2000 kHz.

x) Companding is used in PCM to

a) reduce bandwidth

b) reduce power

c) increase S/N ratio

d) get almost uniform S/N ratio.

xi) In the bipolar NRZ or AMI line codes the binary zero is represented by

a) alternate 0s and 1s

b) alternate + *A* and – *A* amplitudes

c) zero amplitude

d) none of these.

xii) Which of the following is a disadvantage of TDM ?

a) Inter-modulation distortion is absent

b) Full available channel bandwidth can be utilized for each channel

c) Due to slow narrow band fading all the TDM channel may get wiped out

d) Problem of cross talk is severe.

xiii) Which of the following is not a property of Hamming code ?

a) No. of check bits $q \geq 3$

b) Block length $n = 2^q + 1$

c) No. of message bits $k = n - q$

d) Minimum distance $d_{\min} = 3$.

xiv) The height of the geostationary satellite from the earth surface is approximately

a) 42,600 km b) 15,000 km

c) 35,786 km d) 6,400 km.

xv) The range of azimuth angle in satellite communication is

a) 0° to 90° b) 0° to 360°

c) 0° to 180° d) 90° to 180°.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. a) Why modulation is needed ?

   b) What do you mean by AM envelope ?

   c) What are the frequency components in an AM wave ? Write the bandwidth of AM. 2 + 1 + 2

3. a) What is angle modulation ?

   b) Write the advantages and disadvantages of FM compared to AM ?

   c) State Carson's rule of FM bandwidth.

4. a) State sampling theorem. Define aliasing.

   b) Make comparison of different pulse analog modulation methods. 2 + 3

5. Discuss the indirect method of generating a wide-band FM signal. 3 + 2

6. a) An SSB signal contains 1 kW power. How much power is contained in the side band and how much at the carrier frequency ?

   b) What is VSB modulation ? 2 + 2 + 1

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Define the following terms :
   Block Code, Code Vectors, Code Weight, Code Word.

b) Consider a (7, 4) linear block code whose generator matrix is given below :

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

Find the code vector for a message 1011 and also the parity check matrix.

c) The parity check bits of an (8 , 4) block code are given by,

$$c_1 = m_1 + m_2 + m_3$$
$$c_2 = m_1 + m_2 + m_3$$
$$c_3 = m_1 + m_3 + m_4$$
$$c_4 = m_2 + m_3 + m_4$$

Find generator matrix and parity check for this code.

d) What is Hamming code ? 4 + 5 + 5 + 1

8. a) Explain the detection of AM signals using envelope detector.

b) Explain with block diagram low level and high level modulation techniques.

c) A transmitter radiates 9 kW without modulation and 10·125 kW after modulation. Determine depth of modulation.

d) Find the bandwidth of a commercial FM transmission, if frequency deviation is 75 kHz and modulating frequency is 15 kHz. 4 + 4 + 4 + 3

9. a) Explain with the block diagram the generation and detection process of PCM.

   b) A telephone signal has a maximum frequency of 4 kHz. It is limited within the voltage of +V & –V. It is transmitted by using PCM. The required signal to quantization noise ratio is 40 dB. What is the minimum bandwidth required for the transmission ?

   c) Distinguish between ASK, FSK and PSK in terms of their performances.

   d) Encode the bit sequence 10110011010 in the NRZ-polar and RZ-bipolar format. 6 + 4 + 3 + 2

10. a) What is satellite ? Explain Kepler's law of planetary motion.

    b) Find out the height of the geostationary satellite.

    c) Explain the satellite uplink model.

    d) Define Lock Angles. 4 + 4 + 5 + 2

11. Write short notes on any *three* of the following : 3 × 5

    a) Balanced Modulator

    b) Super-heterodyne receiver

    c) Frequency Shift Keying

    d) Satellite Link Model

    e) Error Detection Methods.

==========