



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 × 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.

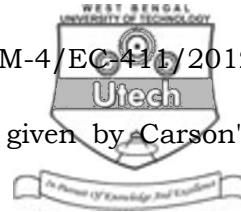
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vii) Bandwidth of a single tone WBFM, given by Carson's Rule is

- a)  $\Delta\omega + \omega_m$                       b)  $2(\Delta\omega + \omega_m)$   
 c)  $2\Delta\omega$                                 d)  $2\omega_m$ .

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.

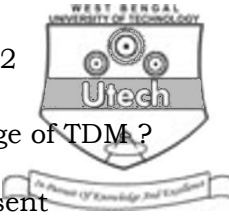
x) Companding is used in PCM to

- 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.

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- xii) Which of the following is a disadvantage of TDM ?
- Inter-modulation distortion is absent
  - Full available channel bandwidth can be utilized for each channel
  - Due to slow narrow band fading all the TDM channel may get wiped out
  - Problem of cross talk is severe.
- xiii) Which of the following is not a property of Hamming code ?
- No. of check bits  $q \geq 3$
  - Block length  $n = 2^q + 1$
  - No. of message bits  $k = n - q$
  - Minimum distance  $d_{\min} = 3$ .
- xiv) The height of the geostationary satellite from the earth surface is approximately
- 42,600 km
  - 15,000 km
  - 35,786 km
  - 6,400 km.
- xv) The range of azimuth angle in satellite communication is
- $0^\circ$  to  $90^\circ$
  - $0^\circ$  to  $360^\circ$
  - $0^\circ$  to  $180^\circ$
  - $90^\circ$  to  $180^\circ$ .

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**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.

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- 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

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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.

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