ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2007

PRINCIPLES OF COMMUNICATION ENGINEERING

SEMESTER – 4

Time : 3 Hours] [Full Marks : 70

Group – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : $10 \times 1 = 10$

i) In PCM, the biggest advantage as compared to AM is

a) larger bandwidth

b) larger noise

c) inability to handle analog signals

d) incompatibility with time division multiplexed system. ☐

ii) The saving in power in a DSB-SC system, modulated at 80% is

a) NIL b) 80%

c) 75·76% d) 50%. ☐

iii) In the spectrum of FM

a) the carrier frequency disappears when the modulation index is large

b) the amplitude of any sideband depends on modulation index

c) the total number of sidebands depends on modulation index

d) carrier frequency cannot disappear. ☐

iv) The difference between PM and FM

a) is purely theoretical as they are same in practice

b) is too great to make the two systems compatible

c) lies in the poorer audio response of phase modulation

d) lies in the different definition of modulation index. ☐

v) In TV telecast, the sound signal is modulated in

a) SSB b) VSB

c) FM d) AM. ☐

vi) The intermediate frequency used for a superheterodyne AM receiver is

a) 455 kHz b) 755 kHz

c) 545 kHz d) 745 kHz. ☐

vii) Which one is a digital modulating scheme ?

a) PCM b) PAM

c) PPM d) PWM. ☐

viii) If the number of bits in PCM code word is increased from 7 bit to 8 bit, the SNR

a) is increased b) is decreased

c) remains constant d) cannot be determined. ☐

ix) If the number of bits in PCM code word is increased from 7 bit to 8 bit the SNR

a) increases by 10 dB b) decreases by 10 dB

c) increases by 6 dB d) increases by 8 dB ☐

x) If the SNR of the signal is increased, then the channel capacity

a) is increased b) is decreased

c) remains constant d) cannot be determined. ☐

Group - B

(Short Answer Type Questions)

Answer any *three* questions. $3 \times 5 = 15$

2. How can balanced modulator be used to generate a DSB-SC signal ?

3. Distinguish between PAM, PWM and PPM.

4. What are up-link and down-link ? Why is the up-frequency higher than down-link ?

5. A standard AM transmission, sinusoidally modulated to a depth of 30% produces side frequencies of 4·928 and 4·914 MHz. The amplitude of each side frequency is 75 V. Determine the amplitude and frequency of the carrier.

6. What is the function of MODEM ? Explain.

Group - C

(Long Answer Type Questions)

Answer any *three* questions. $3 \times 15 = 45$

7. a) Show that for wideband FM, the bandwidth requirement is given by $BFM \cong 2B (1 + 2\beta)$ where the symbols have their usual significance. 4

   b) Discuss about the roles of pre-emphasis and de-emphasis circuits in FM Broadcasting. 4

   c) Explain how PLL can be used as an FM demodulator. 5

   d) Write down the advantages of FM over AM. 2

8. a) Draw the block diagram of a superheterodyne receiver and explain the function of each block. 6

   b) In a broadcast superheterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit is 100. If the intermediate frequency is 455 kHz, calculate image frequency and its rejection ratio

      i) at 1000 kHz

      ii) at 25 MHz. 4

   c) Draw a diagram of a D/A converter and explain its working principle. 5

9. a) Write the advantages of digital communication over analog communication. 3

   b) What is BFSK ? Draw and explain how BFSK is non-coherently detected. 5

   c) What do you mean by channel capacity ? Calculate the capacity of an AGWN channel with a bandwidth of 1 MHz and SNR of 40 dB. 5

   d) Write the negative statements of Shannon's theorem. 2

10. a) What is the Shannon-Hartley theorem for channel capacity ? 2

b) Represent the Block Codes in Matrix form. 7

c) A Gaussian channel has 1 MHz bandwidth. Calculate the channel capacity if the signal power to noise spectral density ratio (S/η) is 10^5 Hz. Also find the maximum information rate. 6

11. a) With the help of a block diagram, explain the working principles of coherent ASK generation and detection principles. 6

b) Compare between ASK, FSK and PSK. 5

c) Sketch the binary waveform for the following bit sequence : 4

110101001