Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (CSE/IT)/SEM-4/EC-411/2011

2011

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) If the noise level of the signal is increased then capacity of a band limited AWGN channel

      a) is increased b) is decreased

      c) remains constant d) none of these.

   ii) The modulation index of an AM wave is changed from 0 to 1. The transmitted power is

      a) unchanged

      b) halved

      c) doubled

      d) increased by 50 percent.

iii) In telephone channel, the bandwidth of each frequency division multiplexed SSB voice channel in a basic group is

a) 4 kHz b) 5 kHz

c) 3 kHz d) none of these.

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

a) 455 kHz b) 755 kHz

c) 545 kHz d) 745 kHz.

v) If f_m is the frequency of the message signal then bandwidth of narrow band frequency modulated signal is

a) f_m b) $2 f_m$

c) infinity d) none of these.

vi) If an FM wave has been generated from the message signal $m(t)$ then a PM wave can also the generated from

a) $\int m(t)\,dt$ b) $\frac{d}{dt} m(t)$

c) $[m(t)]^2$ d) none of these.

vii) Source coding in a data communication system is done in order to

a) enhance the information transmission rate

b) reduce transmission error

c) conserve the transmitted power

d) facilitate clock recovery in the receiver.

viii) Satellite capacity depends on

a) weight that can be placed in orbit

b) panel area available for energy dissipation

c) transmitter power

d) all of these.

ix) The main advantage of PCM system is

a) lower bandwidth b) lower power

c) lower noise d) none of these.

x) Which one is a digital modulating scheme ?

a) PCM b) PAM

c) PPM d) PWM.

xi) Entropy is basically a measure of

a) rate of information

b) average information

c) probability of information

d) disorder of information.

xii) One of main functions of the RF amplifiers in a superheterodyne receiver is to

a) provide improved tracking

b) permit better adjacent channel rejection

c) increase the tuning range of the receiver

d) improve the reflection of the image frequency.

xiii) If the incoming carrier frequency in a super-heterodyne receiver is 1100 kHz with an intermediate frequency of 455 kHz, the image frequency is

a) 910 kHz b) 1555 kHz

c) 2010 kHz d) none of these.

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

a) VSB b) SSB

c) AM d) FM.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. a) What is the function of a transponder in satellite communication ? 3

   b) State the importance of 6/4 GHZ system. 2

3. Encode the data stream 110100 using the following line coding techniques :

   a) Rz (polar)

   b) Rz (bipolar)

   c) NRZ (polar).

4. a) Define modulation. 2

   b) Why is modulation needed in a communication system ? 3

5. a) State sampling theorem. $2\frac{1}{2}$

   b) What is aliasing ? $2\frac{1}{2}$

6. With a neat sketch describe the indirect method of FM generation. 5

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Considering a sinusoidal modulating signal $m(t)$ and carrier $c(t)$, draw the following waveforms :

   i) AM signal

   ii) PM signal

   iii) FM signal. 2 + 2 + 2

   b) Derive the general expression for PM and FM waves. Hence comment on the relationship between them. 8 + 1

8. a) Draw the circuit of a weighted resistor type D/A converter and explain its principle of operation. 2 + 5

   b) What do you mean by geostationary satellite ? 2

   c) A 500 W carrier is modulated on a depth of 50%. Calculate the total power in the modulated wave in the following forms of AM :

   i) DSB with full carrier

   ii) DSB with suppressed carrier. 6

9. a) With the help of necessary diagrams explain the basic principle of operation of TDM. 3 + 5

   b) Discuss the relative merits and demerits of ASK, PSK and FSK. 7

10. a) Give a neat sketch of an envelope detector circuit and explain its principle of operation. 7

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. 6

c) Find the bandwidth of a commercial FM transmission, if frequency deviation is 75 kHz and modulating frequency is 15 kHz. 2

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

a) Ring modulator

b) Pulse modulation

c) Entropy

d) LEO and MEO

e) Delta modulation.