# ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE - 2009

## PRINCIPLES OF COMMUNICATION ENGG.

## SEMESTER - 4

Time : 3 Hours ] [ Full Marks : 70

### GROUP - A

### ( Multiple Choice Type Questions )

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) A signal $g(t)$ is said to be periodic if for some positive constant $T_0$,

a) $g(t) = g(t + T_0)$ b) $g(t) = g(t - T_0)$

c) $g(t) = g(t + T)$ d) $g(t) = g(T_0 - t)$. ☐

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 per cent. ☐

iii) The most commonly used filters in SSB generation are

a) mechanical b) RC

c) LC d) Band-Pass. ☐

iv) An FM signal with a deviation $\delta$ is passed through a mixer and has its frequency reduced fivefold. The deviation in the output of the mixer is

a) $5\delta$ b) indeterminate

c) $\delta/5$ d) $\delta$. ☐

v) A pre-emphasis circuit provides extra noise immunity by

a) boosting the bass frequencies

b) amplifying the higher audio frequencies

c) preamplifying the whole audio band

d) converting the phase modulation to FM. ☐

vi) A superheterodyne receiver with an IF of 450 kHz is tuned to a signal at 1200 kHz. The image frequency is

a) 750 kHz b) 900 kHz

c) 1650 kHz d) 2100 kHz. ☐

vii) DSB-SC signal can be demodulated using

a) a high pass filter b) a phase discriminator

c) a PLL d) an envelop detector. ☐

viii) Armstrong F.M. transmitter performs frequency multiplication in stages

a) to increase overall S/N ratio

b) to reduce BW

c) to find desire value of carrier

d) for convenience. ☐

ix) In a commercial FM broadcast the modulating frequency is limited about

a) 3.4 kHz b) 5 kHz

c) 15 kHz d) 25 kHz. ☐

x) The length of antenna to transmit a signal must be at least

a) 1/3 wavelength

b) 2/3 wavelength

c) 1/4 wavelength. ☐

xi) SSB system is not used for braodcasting because

a) there will be poor fidelity as only one side band is transmitted

b) there is more power in side bands

c) transmitters and receivers are complicated

d) all of these. ☐

xii) If maximum frequency present in one TDM signal is $f_m$, then for proper detection the message signal's sampling rate $f_s$ should follow the relation

a) $f_s = f_m$ b) $f_s > f_m$

c) $f_s \geq 2f_m$ d) $f_s = 2f_m$. [ ]

xiii) 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. [ ]

xiv) 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 different definition of modulation index

d) lies in the poorer audio response of phase modulation. [ ]

xv) Which of the following gives maximum probability of error ?

a) ASK b) FSK

c) PSK d) DPSK. [ ]

## GROUP – B
## ( Short Answer Type Questions )

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

2. a) Explain low-level and high-level AM modulation with block diagrams.

b) What are the frequency components in an AM wave ? 3 + 2

3. a) State Sampling theorem. What is aliasing ?

b) Draw the corresponding PAM, PWM and PPM signal waveforms with reference to an arbitrary message signal waveform. 2 + 3

4. Define the following terms :

   i) Code word

   ii) Code rate

   iii) Code vectors

   iv) Hamming distance

   v) Minimum distance in context to error control coding.

5. a) Explain briefly a general structure of satellite communication system.

   b) State the importance of 6/4 GHz system. 3 + 2

6. How does PLL work as FM demodulation ?

## GROUP – C

### ( Long Answer Type Questions )

Answer any *three* questions. 3 × 15 = 45

7. What is Satellite ? Explain Kepler's law. What is passive satellite ? Write down the advantages and disadvantages of Geostationary satellite. What is ISL ? Define Prograde and Retrograde. 2 + 3 + 2 + 4 + 2 + 2

8. Explain satellite uplink model. What are the basic difference between FDM and TDM ? Define deviation ratio in FM.

   A radio ( AM ) station transmits at 10 KW when percentage of modulation is 60%. Calculate the carrier power. Find the power saving if SSB_SC is transmitted instead of AM signal. 5 + 4 + 2 + 4

9. What is coding ? Classify different kinds of coding. Explain what is the function Modem. Explain the generation of binary PSK signal. Prove that, Mutual information $I(x, y) = H(x) - H(x/y)$. 2 + 2 + 4 + 3 + 4

10. a) Which is the fastest ADC and why ?

    b) What is the function of MODEM ? Explain.

    c) What are the elements of a satellite communication system ?

    d) What is encoding ?

    e) Consider the binary sequence 101011001. Draw the waveform of the following signaling format :

       i) Unipolar RZ signaling.

       ii) Bipolar RZ signaling. 2 + 3 + 5 + 1 + 4

11. a) What is multiplexing ?

b) How is multiplexing done by sharing the time ?

c) Distinguish between source coding and channel coding.

d) The parity check matrix of a ( 6, 3 ) block code is given by

$$H = \begin{Bmatrix} 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 \end{Bmatrix}$$

Find the generator matrix ( $G$ ) and construct all possible code words.

2 + 5 + 3 + 5

END