d) A carrier wave of frequency 100 MHz is frequency modulated by a sinusoidal wave of amplitude 20 V and frequency 100 kHz. The frequency sensitivity of the modulator is 25 kHz/V. Determine the approximate bandwidth of FM signal. 4

8. a) Explain Carson's rule. 5

b) Explain the effect of aliasing. 4

c) ASK, FSK and PSK Sketch the Binary waveform of digital modulation schemes for the following 8-bit sequence :

10110101. 6

9. a) Draw the Transmitter and Receiver model of PCM. 5

b) Explain 'Quantization' in PCM. 7

c) Write down the disadvantages of PCM. How can quantization error be minimized ? 3

10. a) Define entropy and mutual information and also prove $I(X_i, Y_j) = I(Y_j, X_i)$. 4

b) If the information 1 and 0 transmit through the channel from T_x to R_x with probability of error P, find out $P(Y = 0)$, $P(Y = 1)$. 3

c) Explain Shannon-Fano Algorithm with suitable example. 8

11. a) What do you mean by delta modulation ? 5

b) Explain adaptive delta modulation with proper waveform. 5

c) Discuss FM demodulation using phase locked loop (PLL). 5

2013

COMMUNICATION ENGINEERING AND CODING THEORY

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 answers for the following : 10 × 1 = 10

i) The higher modulating frequency used in AM broadcast system is

a) 10 kHz b) 15 kHz

c) 5 kHz d) 2 MHz.

ii) The maximum power efficiency of an AM modulator is

a) 25% b) 50%

c) 75% d) 100%.

iii) A PWM signal can be generated by

a) a monostable multivibrator

b) an astable multivibrator

c) integrating the PPM signal

d) differentiating the PPM signal.

iv) Pulse width of modulation is a process whereby

a) the position of a pulse is changed as a function of the sampled value

b) the sampled value is first coded and then transmitted

c) the width of a pulse is varied as a function of the sampled value

d) none of these.

v) An angle-modulated signal is expressed by

$f(t) = \cos(2 \times 10^8 \pi t + 75 \sin 2 \times 10^3 \pi t)$

The peak frequency deviation of the carrier will be

a) 1 kHz b) 7·5 kHz

c) 75 kHz d) 100 MHz.

vi) In QAM both identities ..... are varied.

a) amplitude and phase b) frequency and phase

c) bit rate and phase d) baud rate and phase.

vii) The use of non-uniform quantization leads to

a) reduction in transmission BW

b) increase in max. SNR

c) increase in SNR for low level signals

d) simplification of quantization process.

viii) The baud rate in binary transmission is

a) always equal to the bit rate

b) equal to twice the BW of an ideal channel

c) not equal to signalling rate

d) equal to one half of the BW of ideal channel.

ix) Which multiplexing technique transmits digital signals ?

a) FDM b) TDM

c) WDM d) both (a) and (b).

x) The Nyquist rate of sampling for the signal

$x(t) = \text{sinc}(200\,t) + \text{sinc}^2(200\,t)$ is

a) 200 b) 400

c) 300 d) 250.

GROUP – B

(Short Answer Type Questions)

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

2. Discuss the relative merits and demerits of ASK, PSK and FSK.

3. Determine the power content of the carrier and each of the sidebands for an AM signal having the modulation index 0·8 and the total power of 2500 watt.

4. Explain both transmitting and receiving systems of TDM.

5. What is non uniform quantization ?

Define the following :

(i) μ-Law compounding

(ii) *A*-Law compounding. 1 + 2 + 2

6. Derive the expression for power contents in AM wave. What is the transmission efficiency of AM signal ? 4 + 1

GROUP – C

(Long Answer Type Questions)

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

7. a) What are the needs of modulation in communication system ? 3

b) Show that $P_t = P_c\left(1 + \frac{m^2}{2}\right)$, where P_t =total power in AM, P_c = carrier power, m = modulation index. 5

c) Write down advantages and disadvantages of SSB over DSB-SC. 3