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Paper Code : CS-401

COMMUNICATION ENGINEERING & 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 alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The maximum power efficiency of an AM modulator is

   a) 25% b) 50%

   c) 75% d) 100%.

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

a) $\frac{1}{3}$ wavelength b) $\frac{2}{3}$ wavelength

c) $\frac{1}{4}$ wavelength d) $\frac{3}{4}$ wavelength.

iii) Which multiplexing technique transmits digital signals ?

a) FDM b) TDM

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

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

a) amplitude and phase

b) frequency and phase

c) bit rate and phase

d) baud rate and phase.

v) DSB-SC signals are generated by a circuit called a

a) balanced demodulator

b) balanced modulator

c) square law modulator

d) notch filter.

vi) Foster-Seeley detector is for detecting

a) PAM b) AM

c) FM d) PCM.

vii) Quantization occurs in

a) PCM b) TDM

c) FM d) PWM.

viii) Number of bits in QPSK symbol is

a) 1 b) 2

c) 3 d) 4.

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

a) ASK b) FSK

c) PSK d) QPSK.

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.

xi) 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. Compare AM and FM.

3. State sampling theorem. What is aliasing ? 2 + 3

4. Compare the merits and demerits of ASK, FSK and PSK.

5. Explain the transmitting and receiving systems of FDM.

6. What is non-uniform quantization ?

7. a) Draw the block diagram of basic communication system.

   b) Compare DSB-FC, DSB-SC and SSB-SC. 2 + 3

GROUP – C

(Long Answer Type Questions)

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

8. a) What is the need 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. 4

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

d) A modulating signal $5\sin(2\pi\times5\times10^3t)$ is used to modulate a carrier signal $10\sin(2\pi\times10^6t)$. Determine the modulation index, frequencies of the sideband components and their amplitude. Draw the waveform of the AM wave using the appropriate value and find the bandwidth of the modulated waveform. 5

9. a) Draw the transmitter and receiver model of PCM. 4

b) Derive the expression of SNR in PCM system. 4

c) Write down the disadvantages of PCM. How can quantization error be minimized ? 4

d) Encode the sequence 10110001 in the following form :
(i) Unipolar NRZ, (ii) Manchester coding. 3

10. a) Derive the expression of single-tone FM signal. 4

b) Convert from FM to PM and PM to FM with the help of expression and block diagram. 2 + 2

c) A single tone FM is represented by the voltage equation as $v(t)=12\sin(6\times10^8t+5\sin12150t)$. Determine (i) carrier frequency, (ii) modulating frequency, (iii) the modulation index. 5

d) Find the expression of the bandwidth of FM signal using Carson's rule. 2

11. a) Explain the generation and detection process of BFSK signal. 3 + 4

b) Explain Delta Modulation with proper waveform. What are the drawbacks ? 5 + 3

12. a) Briefly explain the term 'Entropy'. A source produces 4 symbols A, B, C and D with probabilities $\frac{1}{8}, \frac{3}{8}, \frac{1}{8}$ and $\frac{3}{8}$. Find entropy of the source. 2 + 3

b) A DMS has alphabets $S_0, S_1, \ldots, S_4$ with probability 0·55, 0·15, 0·15, 0·1 and 0·05 respectively. (i) Find the average code word length using Shannon-Fano algorithm and (ii) the efficiency of the code. 5

c) What is meant by channel capacity ? How is it dependent on SNR ? 2 + 3

13. Write short notes on any *three* of the following : 3 × 5

a) PLL

b) Varactor diode modulator

c) Adaptive Delta Modulation

d) DPCM

e) QPSK.