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(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2492 Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-VI) THEORY EXAMINATION, 2012-13

ANALOG & DIGITAL COMMUNICATION

Time : 3 Hours] *[Total Marks : 100*

SECTION – A

1. Attempt all parts in this question. 10 × 2 = 20

(a) What are low level and high level modulation ?

(b) What is the capture effect in FM receivers ?

(c) What is modulation index and percentage modulation in AM ?

(d) Define inter symbol interference (ISI).

(e) List the spread spectrum techniques.

(f) What are the three properties of PN sequence ?

(g) What is isotropic source ?

(h) Define channel capacity.

(i) What is data compaction ?

(j) What is Shannon limit for information capacity ?

SECTION – B

2. Attempt any **three** parts. **3 × 10 = 30**

(a) Consider the AM signal

$$S(t) = A_c[1 + \mu \cos (2\pi f_m t)] \cos (2\pi f_c t)$$

produced by a sinusoidal modulating signal of frequency f_m. Assume that the modulation factor is $\mu = 2$, and the carrier frequency f_c is much greater than f_m. The AM signal S(t) is applied to an ideal envelope detector, producing the output V(t).

(i) Determine the Fourier series representation of $v(t)$.

(ii) What is the ratio of second-harmonic amplitude to fundamental amplitude in $v(t)$?

(b) Evaluate the autocorrelation functions and cross-correlation functions of the in-phase and quadrature components of the narrowband noise at the coherent detector input for

(i) the DSB-SG system

(ii) an SSB system using the lower sideband

(c) (i) Plot the spectrum of PAM wave produced by the modulating signal $m(t) = A_m \cos (2\pi f_m t)$ assuming a modulation frequency $f_m = 0.25$ Hz, sampling period $T_s = 1$ s, and pulse duration $T = 0.45$ s.

(ii) Using an ideal reconstruction filter, plot the spectrum of the filter output.

(d) A PSK signal is applied to a correlator supplied with a phase reference that lies within ϕ radians of the exact carrier phase. Determine the effect of the phase error ϕ on the average probability of error of the system.

(e) Draw and explain the block diagram of TDM system. Also list the basic problems involved in the design of a digital multiplexor.

SECTION – C

Attempt all questions in this section. $5 \times 10 = 50$

3. Draw the block diagram of a superheterodyne receiver and explain the function of each block.

OR

(i) How is superheterodyne receiver better than TRF ?

(ii) How is the transmitted power distributed over carrier and sidebands in an AM signal ?

4. Explain the direct and indirect method FM transmitter.

OR

With the help of block-diagram, discuss Armstrong system of generating FM signals. Explain balanced FM demodulator.

5. Draw the block-diagram of pulse width modulation and explain its working.

OR

What is pulse code modulation ? Using suitable diagram, explain the quantization of signals.

6. Explain the operation of FSK transmitters and receiver and discuss about the bandwidth requirements of FSK signals.

OR

Discuss the similarities between MSK and offset QPSK and the features that distinguish them.

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7. A voice-grade channel of the telephone network has a bandwidth of 3.4 KHz :

(i) Calculate the information capacity of the telephone channel for a SNR of 30 dB.

(ii) Calculate the minimum SNR required to support information transmission through the telephone channel at the rate of 9600 b/s.

OR

Explain briefly :

(i) T_1 carrier system

(ii) Shannon Fanno coding