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

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

B. Tech.

(SEM. VI) THEORY EXAMINATION 2010-11

ANALOG AND DIGITAL COMMUNICATION

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **ALL** questions.

(2) Each question carries equal marks.

(3) Assume data wherever missing.

1. Attempt any **four** of the following : **(4×5=20)**

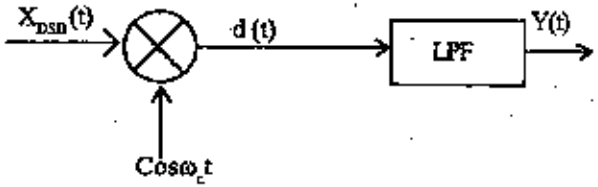
(a) Draw the block-schematic diagram of a communication system and explain. What are the advantages of a digital communication system over an analog communication system ?

(b) Explain the difference between baseband and bandpass communication. Give examples.

(c) State frequency shifting property and prove that :

$g(t) \sin\omega_0 t \leftrightarrow 1/2j[G(\omega - \omega_0) - G(\omega + \omega_0)]$

(d) Evaluate the effect of phase and small frequency error in the local oscillator on synchronous DSB demodulation as shown :



(c) Draw the block diagram of a typical FDM transmitter and receiver and explain. What is crosstalk ? How is it reduced in FDM system ?

(f) A Superheterodyne receiver with F_{IF} = 500 kHz and 3.5 < f_{LO} < 4.0 MHz has a tuning dial calibrated to receive signals from 3 to 3.5 MHz. It is set to receive a 3.0 MHz signal. The receiver has a broadcast RF amplifier, and it has been found that the LO has a significant third harmonic output. If a signal is heard, what are all its possible carrier frequencies ?

2. Attempt any **four** of the following : **(4×5=20)**

(a) The instantaneous frequency of a sine wave is equal to $f_c - \Delta f$ for $|t| \leq T/2$, and f_c for $|t| > T/2$. Determine the spectrum of this frequency modulated sine wave.

(b) Explain the use of pre-emphasis and de-emphasis in an FM system.

(c) A carrier wave of frequency 100 MHz is frequency modulated by a sinusoidal wave of amplitude 20 volts and frequency 100 kHz. The frequency sensitivity of modulator is 25 kHz per volt. Determine the approximate bandwidth of FM signal, using Carson's rule.

(d) Using block diagram, explain the indirect method of generating narrowband FM signal.

(e) 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 an SSB system using the lower sideband.

Give the general representation of noise in communication system and calculate the power spectral density of it.

3. Attempt any **two** of the following : **(2×10=20)**

(a) What is meant by Pulse modulation ? With the help of circuit diagrams, explain the generation and demodulation of Pulse position modulation ?

(b) The output signal to quantization noise ratio is defined as the ratio of normalized signal power to normalized quantization noise power. For a full scale sinusoidal modulating signal with amplitude A and for a uniform quantizer with a given dynamic range, show that if the number of quantization levels is doubled then signal to quantization noise power increases by 7.8 dB.

(c) Draw and explain the block diagram of transmitter and receiver of DPCM. How much SNR improvement is achieved in comparison to PCM ?

4. Attempt any **two** of the following: **(2×10=20)**

(a) What should be the desirable features of a digital modulation technique ? For a bit stream 101101 represented in split phase line code, draw the modulation waveform for

transmitting binary information over base band channels, for the following modulation schemes : ASK, FSK, PSK.

(b) Using block diagrams, explain coherent and non-coherent generation and detection of an FSK system.

(c) Write short notes on any **two** of the following :

(i) PCM

(ii) Threshold of coding and slope overload noise in DM

(iii) ADM.

5. Attempt any **two** of the following : **(2×10=20)**

(a) Explain T1 carrier system with the help of a block diagram. Describe the synchronizing and signaling of a T1 carrier system.

(b) A DMS emits six messages with probabilities 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Find Quaternary Huffman code. Determine its average word length, efficiency and redundancy.

(c) State and prove 'source coding theorem'. Consider the code as listed below :

Symbol	Code
A	00
B	01
C	10
D	110
E	111

The occurrence of symbols in the codeword is equiprobable. Find whether the code is possible or not ? Find the efficiency of the code and check for the separability of the code.