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B.TECH.
(SEM. VI) THEORY EXAMINATION 2018-19
ANALOG & DIGITAL COMMUNICATION

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

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. **2 x 10 = 20**

a. With the help of block diagram briefly explain the working of communication system.
b. Find transmission power efficiency for a tone modulated signal when modulation index is 0.25.
c. For white noise interference is it true that noise power spectral density does not vary with frequency at receiver output for phase modulated system while increase in quadratic manner for FM system?
d. Distinguish between Narrow band F.M. and Wide band F.M. with their basic equations.
e. What is Aliasing and how it is reduced?
f. Find the nyquist rate and nyquist interval for signal:
(i). $X(t) = 4 \sin(30\pi t) + 3 \cos(70\pi t)$
(ii). $X(t) = -10\sin(40\pi t)\cos(300\pi t)$
g. Write down the difference between coherent and non-coherent ASK.
h. What is TDM?
i. Write short note on PCM hierarchy?
j. What do you mean by measure of information?

SECTION B

2. Attempt any *three* of the following: **10x3=30**

a. Give the method for generation of AM DSBSC signals. How will you demodulate such signals? Give suitable block/function diagram with necessary mathematical analysis.
b. Consider a frequency modulated signal is given by: $V_{FM}= 20\cos [2\pi\times10^6 t+0.1\sin (10^4\pi t)]$. Given $k_f=10\pi$, derive the expression for the modulating signal.
c. State the sampling theorem and explain. How will you recover the signal from its samples?
d. Explain the operation of FSK transmitters and receiver and discuss about the bandwidth requirements of FSK signals.
e. Construct a Shannon-fano ternary code for the following ensemble and find code efficiency and redundancy.
$S = \{s_1, s_2, s_3, s_4, s_5, s_6, s_7\}$
$P = \{0.3, 0.3, 0.12, 0.12, 0.06, 0.06, 0.04\}$ with $x = \{0, 1, 2\}$

SECTION C

3. Attempt any *one* part of the following: 10X1=10

a. A multiple-tone modulating signal f(t), consisting of three frequency components, is given by $f(t)=E_1\cos \omega_1 t+E_2\cos \omega_2 t+E_3\cos \omega_3 t$; where $\omega_1 > \omega_2 > \omega_3$ and $E_1>E_2>E_3$ the signal f(t) modulates a carrier $c(t)=E_c\cos\omega_c t$.
   i. Derive an expression for AM wave.
   ii. Draw a signal-sided spectrum, and find the bandwidth of the AM wave.

b. Compare the following amplitude modulated system for Transmission/reception efficiencies:
(i) DSB with carrier; (ii) DSB/SC; (iii) SSB (iv) V. S. B.

4. Attempt any *one* part of the following: 10X1=10

a. Analyze Noises present in Analog Modulation System and derive its signal to Noise Ratio. Also calculate figure of merit.

b. In an FM system a 7 kHz modulating signal modulates 107.6 MHz carrier wave, so that the frequency deviation is 50 kHz. Determine:
(i). Carrier swing in the FM signal and modulation index.
(ii). The highest and lowest frequency attained by the FM signal.

5. Attempt any *one* part of the following: 10X1=10

a. With the help of Block diagram explain the working of Delta Modulation. How adaptive Delta Modulator improves the performance of Delta Modulator.

b. Draw and explain the block diagram of transmitter and receiver of DPCM system.

6. Attempt any *one* part of the following: 10X1=10

a. Explain the working of the coherent ASK receiver and obtain the expression for the probability of error.

b. Draw the block diagram of Transmitter and Receiver of BPSK. Explain its working.

7. Attempt any *one* part of the following: 10X1=10

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

b. Given a telegraph source having two symbols, dot and dash. The dot duration is 0.2s. The dash duration is 3 times the dot duration. The probability of the dot's occurring is twice that of the dash, and the time between symbols is 0.2s. Calculate the information rate of the telegraph source.