

BITS – Pilani, Dubai Campus
Knowledge Village, Dubai
Comprehensive Examination
EEE UC 383 Communication Systems

Date: 24. 03. 05

Duration : 3 Hrs.

Max. Marks: 30

1. Give features of analog and digital communication systems. 3
2. A binary FSK has how many carriers? Instead of binary, 4-ary and 8-ary schemes are used, how many carriers are there? If the lowest carrier frequency used is 2MHz, in the above three cases, list the values of carrier frequencies, if the next carrier is 1.5 times the previous one? 4
3. Compute the sideband powers and carrier power for AM, AM DSB-SC and AM SSB-SC assuming the modulation index to be 0.7 and the total transmitted power is 50 KW. 3
4. Give block schematic diagram of AM SSB-SC demodulator with required equations. 3
5. A square wave of frequency 1KHz is used to frequency modulate a 1MHz sine carrier. The frequency modulation constant has a value of 8 KHz/ V, p-p value of square wave is 3V in the first cycle, 2V p-p in the second cycle, 1V p-p in the third cycle. Find the p-p frequency deviation in the above cases and plot the approximate modulated wave for three cycles. 6
6. Give the circuit diagram of balanced discriminator and the frequency response, combining the two halves. 4
7. The random experiment of throwing a die has the probability space denoted by $X(W,B,P)$ where, $W = \{1,2,3,4,5,6\}$. If for all w_i , $x(t;w_i) = w_i \exp(-t)$. $u_i(t)$ is the random process, plot the sample functions of this random process for $i = 1,2,3,4$. 4
8. The message signal $m(t)$ has a BW of 8KHz and power of 15 KW and maximum amplitude of 5. Channel attenuation is 80dB. Additive white noise has a power spectral density of 10^{-5} W/Hz ($N_0/2$). It is required to achieve a modulator SNR of 50dB. Find the required transmitter power and channel BW for (a) conventional AM with modulation index of 0.8 (b) AM DSB – SC (c) AM SSB – SC. 3

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TEST – II (Regular)

Date : 08.05.05

Duration : 50min

Max. Marks : 10

1. Given a random process $x(t) = k$, k is an RV uniformly distributed in the range $(-1, 1)$, (a) sketch the ensemble of this process (b) determine $x(t)$ (c) determine $R_x(t_1, t_2)$. 3

2. For a DSB – SC system with a channel noise PSD of $S_n(w) = 10^{-10}$ and baseband signal of bandwidth 4KHz, the receiver output SNR is required to be at least 30dB. The receiver is as shown in fig. 12.3.
 - (a) What must be the signal power received at the receiver input?
 - (b) What is the receiver noise power?
 - (c) What is the minimum transmitted power if the channel transfer function is $H_c(w) = 10^{-4}$ over the transmission band? 4

3. In many communication systems, the transmitted signal is limited by peak power rather than by average power. Under such a limitation, AM fares much worse than DSB – SC or SSB – SC. 3

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Test-1 (Regular)

Date: 27. 03. 05

Duration: 50 min

Max. Marks: 10

1. How does a ideal filter differ from a practical filter? Show with suitable equations and diagrams. 2
2. Estimate the essential BW W rad./s of the signal $\exp(-50t) \cdot u(t)$, if the essential band is to contain 90% of the signal energy. 2
3. Sketch the AM DSB – SC waveform for $m(t) = 10 \sin(3140t)$, assuming carrier to be 250 times that of modulating frequency and having $A=25$. Draw the baseband and modulated wave spectra and modulated waveform. 3
4. Assuming that the maximum modulating frequency is 10 KHz, carrier frequency to be 55 MHz, calculate the FM bandwidth for (a) narrow band (b) wide band. Deviation ratio is 6. Calculate the peak value of modulating signal, if the frequency Modulation constant is 50000 Hz / V. 4