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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; May / June - 2019

Analog and Digital Communication

Time: 3 hrs *Max. Marks: 100*

Note: *i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

ii) Missing data, if any, may be suitably assumed.

UNIT - I

1 a. Explain the generation of DSBSC waves using, 8

i) Balanced modulator ii) Ring modular

b. Explain with the help of a neat sketch, how square law modulator is used to generate AM? 6

c. An audio frequency signal $5\sin 2\pi(1000)t$ is used to amplitude modulate a carrier of $100\sin 2\pi(10^6)t$. Assume modulation index as 0.4. Find; 6

i) Side band frequencies ii) Amplitude of each side band

iii) B.W. required iv) Total power delivered to a load of 100 Ω

2 a. Distinguish between FM and PM wave. 4

b. Describe with necessary equations and block diagram, the generation of narrow band FM. 8

c. A modulating signal $5\cos 2\pi 15\times 10^3 t$, angle modulates a carrier $A\cos w_c t$. Find the modulation index and the bandwidth for the FM system. Determine the change in the bandwidth and modulation index, if FM is reduced to 5 kHz. What is the conclusion of the two results? 8

UNIT - II

3 a. Discuss the properties of Gaussian process. 6

b. Define with relevant equations mean, auto correlation and auto covariance of a random process $X(t)$. 8

c. List the properties of auto-correlation and cross-correlation function. 6

4 a. Describe the channels for digital communication. 7

b. With a neat block diagram, explain digital communication system. 7

c. Explain the Grem-Schmidt orthogonalization procedure. 6

UNIT - III

5 a. Explain the quadrature sampling of band pass signal with related block diagram, spectra and equations. 6

b. A signal $g(t) = 10\cos(20\pi t)\cos(200\pi t)$ is sampled at the rate of 250 samples / s; 8

i) Sketch the spectrum of the sampled signal

ii) Specify the cutoff ideal reconstruction filter so as to recover $g(t)$ from $g_s(t)$

iii) Specify the Nyquist rate for the signal $g(t)$

c. Explain TDM. 6

Contd…2

6 a. Derive the expression for power spectral density of NRZ bipolar format. 6

b. What is ISI? Derive an expression for Nyquist pulse shaping criterion for distortion less base band binary transmission. 8

c. Sketch the encoded waveform for the bit stream 01101100 for the following schemes : 6

i) NRZ unipolar ii) RZ polar

iii) Manchester iv) Bipolar coding

UNIT - IV

7 a. Explain with block diagrams DPCM transmitter and receiver. 8

b. Explain regenerative repeater in a PCM system with a block diagram. 6

c. A PCM system uses a uniform quantizer followed by a 7-bit encoder. The bit rate of the system is 50 M bits / s; 6

i) What is the message bandwidth for which the system operates satisfactorily?

ii) Determine the output SNR when a sinusoidal modulating wave of frequency 1 MHz is applied to the input

8 a. Explain the following with a neat sketch : 5

i) Slope overload distortion

ii) Granular noise

b. Explain Adaptive delta modulation with neat block diagram and equations. 10

c. A DM system with a 10 Hz sinusoidal signal with 1 V peak to peak at the input. It is sampled at 10 times the Nyquist rate; 5

i) What is the step size required to prevent slope overload?

ii) What is the corresponding SNR?

UNIT - V

9 a. Define BFSK. Derive probability of error for a coherent BFSK. 10

b. Describe the QPSK signal with its signal space characterization with a neat block diagram and explain the generation and detection of QPSK signals. 10

10 a. A binary data is transmitted over an AWGN channel using binary PSK at a rate of 1 MBPS. It is desired to have average probability of error $P_e \leq 10^{-4}$. Noise power spectral density is $N_0/2 = 10^{-12}$ W/Hz. Determine the average carrier power required at the receiver input. 8

Take erfc (3.5) = 0.00025.

b. Define BPSK. With a neat block diagram, explain the generation and detection of PSK. Also draw the PSD of PSK. 6

c. With a neat block diagram, explain the non coherent detection of BPSK technique. 6

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