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R 3408

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Third Semester

Information Technology

IT 1202 — PRINCIPLES OF COMMUNICATION

(Regulation 2004)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. If a modulated wave with an average voltage of 20Vp changes in amplitude ± 5V, determine the maximum and minimum envelope amplitudes and the modulation coefficients.

2. Determine the IF bandwidth necessary to achieve a bandwidth improvement of 16 dB for a radio receiver with an RF bandwidth of 320 KHz.

3. An FM transmitter has a rest frequency $f_c = 96\,\text{MHz}$ and a deviation sensitivity $K_f = 4$ KHz/V. Determine the frequency deviation for a modulating signal $V_m(t) = 8\sin(2\pi\, 2000t)$. Determine the modulation index.

4. For an FM receiver with an input frequency deviation $\Delta f = 40\,\text{KHz}$ and a transfer ratio K= 0.01 V/KHz, determine V_{out}.

5. Give the difference between standard FSK and MSK.

6. The binary data 001101001 are applied to the input of a duobinary system. Construct the duobinary coder output without a precoder.

7. How is the original band pass signal reconstructed from quadrature sampled version?

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8. Construct NRZ and RZ unipolar signaling format for the binary sequence 011010.

9. A direct sequence spread BPSK system uses a feedback shift register of length 19 for the generation of PN sequence. Calculate the processing gain of the system.

10. What is the relationship between the bandwidth of a signal before and after it has been encoded using spread spectrum?

PART B — (5 × 16 = 80 marks)

11. (a) With the help of a circuit diagram and suitable waveforms explain the operation of a medium power AM modulator. Discuss the advantages and disadvantages of low level and high level modulation. (16)

Or

(b) Differentiate between the two basic types of radio receivers. Explain the working of a superheterodyne receiver with the suitable block diagram an list out the characteristics of this receiver that makes it superior over others.

12. (a) (i) For an Armstrong indirect FM transmitter with the following parameters, determine

(1) modulation index at the output of the combining network and the power amplifier

(2) frequency deviation at the same two points

(3) transmit carrier frequency

crystal carrier oscillator = 220 KHz

crystal reference oscillator = 10.8 MHz

Sideband voltage $V_m = 0.012\ V_p$. (6)

(ii) Explain the operation of a phase shift discriminator with necessary diagrams. (10)

Or

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(b) (i) Derive an expression for determining the average power of an angle modulated wave. (6)

(ii) For an FM modulator with modulation index $m = 2$, modulating signal $v_m(t) = V_m \sin(2\pi 2000t)$ and an unmodulated carrier $v_c(t) = 8\sin(2\pi 800kt)$

(1) determine the number of sets of significant sidebands

(2) determine their amplitudes

(3) determine the bandwidth

(4) draw the frequency spectrum showing the relative amplitudes of the side frequencies

(5) determine the bandwidth if the amplitude of the modulating signal increases by a factor of 2.5. (10)

13. (a) With suitable block diagrams explain how QPSK signals can be generated and received. How does OQPSK differ from conventional QPSK? (16)

Or

(b) Explain how duobinary and modified duobinary signaling schemes overcome the degradation of system performance due to intersymbol interference. (16)

14. (a) Explain the method suggested by Nyquist for distortion less base band transmission. How are the practical difficulties posed by the ideal solution overcome? (16)

Or

(b) (i) Describe a model for evaluating signal to noise ratio. (6)

(ii) The spectrum of a signal $g(t)$ is defined by the Fourier transform

$$G(f) = 1/\left(\sqrt{1+f^2}\right).$$

Plot the spectrum of the discrete signal $g_\delta(t)$ derived from $g(t)$ by sampling it at the rate $f_s = 2.5$. Calculate the signal to distortion ratio. (10)

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15. (a) Differentiate between direct sequence and frequency hop spread spectrum techniques. Describe coherent based DSSS with suitable block diagram. (16)

Or

(b) (i) Explain a speech transmission technique that retains the quality of speech and employs a reduced transmission rate. (8)

(ii) Explain the two common multiple access techniques for wireless communication. (8)

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