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17EC44

Fourth Semester B.E. Degree Examination, July/August 2021 Principles of Communication Systems

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

1.
 - a. Explain the operation of the switching modulator with circuit diagram, waveforms and relevant expressions. (08 Marks)
 - b. Explain the operation of the costas receiver for detection of DSB-SC waves. (06 Marks)
 - c. Explain the importance of vestigial sideband modulation in communication system. Describe the frequency domain description with message spectrum and VSB modulated wave spectrum. (06 Marks)

2.
 - a. Explain the operation of the envelope detector with circuit diagram, waveforms and relevant mathematical expressions. (08 Marks)
 - b. Explain the principle of operation of the Quadrature-carrier-Multiplexing with block diagram approach. (06 Marks)
 - c. Explain the principle of operation of the frequency-division-multiplexing with suitable block-diagram. (06 Marks)

3.
 - a. Explain the narrow band frequency modulation, with block diagram approach. Explain the generation of narrowband FM using DSB-SC modulator. (07 Marks)
 - b. An FM wave with a frequency deviation of 10kHz at a modulation frequency of 5kHz is applied to two frequency doublers connected in cascade. Determine the frequency deviation and the modulation index of the FM wave at the output of second frequency multiplier. What is the frequency of the adjacent side-frequencies of this FM wave? (05 Marks)
 - c. Explain the operation of the superheterodyne receiver. Mention the function of each block with suitable diagram. (08 Marks)

4.
 - a. Explain the Demodulation of FM signals using circuit diagram and relevant graphs (Any one of the method). (07 Marks)
 - b. Briefly explain about FM stereo multiplexing with multiplexer of FM stereo transmitter and Demultiplexer of FM stereo receiver. (08 Marks)
 - c. Derive an expression for linear model of phase locked loop in FM system. (05 Marks)

5.
 - a. Explain the conditional probability with mathematical expressions. State and prove Baye's rule. (07 Marks)
 - b. Define and write the expressions for mean, correlation and covariance function. (07 Marks)
 - c. Explain the properties of auto correlation function with mathematical expressions. (06 Marks)

6.
 - a. Briefly explain the noises such as shot noise, thermal noise and white noise. (09 Marks)
 - b. Derive an expression for noise equivalent Bandwidth, with relevant circuit and equations. (07 Marks)
 - c. Briefly explain the Noise factor and noise figure with equations. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

- 7 a. Derive an expression for noise in DSBSC receivers with model and relevant expressions. (08 Marks)
- b. Find the figure of merit when the depth of modulation is i) 100% ii) 50% iii) 30% (04 Marks)
- c. Explain the FM threshold effect with phasor diagram, graph and relevant expressions. (08 Marks)
- 8 a. An AM receiver operating with a sinusoidal wave and 80% modulation has an output signal to noise ratio of 30dB. Calculate the corresponding carrier to noise ratio. Prove the formula used (optional). (04 Marks)
- b. Explain the FM threshold reduction process with graph representing the extending threshold effect and block diagram of FM feedback demodulator. (08 Marks)
- c. Explain the significance of Pre-emphasis and De-emphasis in FM system. (08 Marks)
- 9 a. Why we digitize Analog sources? Explain the sampling process with graph showing CT and its DT signal. (08 Marks)
- b. Explain the pulse width modulation with generation circuit, waveforms. Mention the advantages, disadvantages and applications of PWM. (08 Marks)
- c. Explain the Digital Multiplexing with diagram. Mention the number of inputs and rates. (04 Marks)
- 10 a. Explain the generation of pulse amplitude modulation with block diagram and waveforms. Mention the importance of flat-top sampling with waveform. (08 Marks)
- b. For a pulse-amplitude modulation transmission of noise signal with $W = 3\text{kHz}$. Calculate Bandwidth B_T , if $f_s = 8\text{kHz}$ and $\tau = 0.1T_s$. (04 Marks)
- c. Explain the Application to vocoders such as voice model and vocoder with relevant block-diagrams. (08 Marks)

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