

M.SC. INSTRUMENTATION SCIENCE SECOND YEAR SECOND SEMESTER EXAM- 2019

SUBJECT: PRINCIPLES OF ANALOG & DIGITAL COMMUNICATION

Time: 4 Hours

Full Marks: 100

Part - I

Use separate Answer Script for each group
Answer any five questions

1. What is meant by amplitude modulation? Derive the mathematical expression for the spectrum of AM wave and show that an AM wave consist of a carrier and two sideband components. What do you mean by modulation index? State the advantages of AM. 10
2. State the types of detectors used for AM. Explain the working of envelope detector circuit. Draw the input and output waveforms of an envelope detector. 10
3. Explain with a neat circuit diagram the working of an AM wave generator and plot input and output waveform. 10
4. Explain the difference between narrow band FM and wide band FM. Derive an expression for FM wave and plot it.
A FM wave is represented by the following equation
 $V=20 \sin (5 \times 10^8 t + 4 \sin 2500 t)$.
Find (i) Carrier and modulating frequencies. (ii) Modulation index and maximum deviation. (iii) Power dissipated by this FM wave in a 5 Ohm resistor. 10
5. Explain any method of FM generation. Compare between AM and FM. 10
6. Explain Optical-Fibre or Fibre-Optic Telemetry System with proper block diagram 10
7. What is Transmission Error? How can you minimize transmission error in this telemetry system? Explain Current telemetry with block diagram and also interpret on the merits and limitation this type of telemetry system 10

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Part – II (50 Marks)

Answer any five questions

1. Write down Nyquist theorem? How is it connected to the Shannon's theorem? What are the elements of a communication system – write down in details.
2+3+5
2. Describe an Analogue Communication System and compare it to a digital communication system. Why digital communication is preferred over its analogue counterpart? What is Pulse Modulation? What are major blocks of a PCM system?
3+3+2+2
3. Describe the method of sampling. Describe sampling of an analogue signal. Explain the method of Quantisation. What is quantisation Error?
2+2+4+2
4. What is I/Q Modulation? Explain in details. Draw Quadrature Modulator hardware architecture.
2+4+4
5. Describe FSK modulation. Write down expression for $S_i(t)$, the i^{th} waveform for the M-level FSK modulation and explain. Describe the operation of a binary FSK transmitter.
2+3+5
6. Explain in details with suitable diagram the operation of a Coherent QPSK Demodulator.
10
7. What is constellation diagram? Draw constellation diagrams for 4-QAM 1 amplitude, 4 phases; 8-QAM 2 amplitudes, 4 phases; 16-QAM 3 amplitudes, 12 phases and 16-QAM 4 amplitudes, 8 phases.
2+8