SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(AN AUTONOMOUS INSTITUTION)
PUDUCHERRY

Department of Electronics and Communication Engineering

CASE STUDY-2					
Name of the Student	:		**Register No.**	:	
Name of the Subject	:	ANALOG COMMUNICATION – U23ECB402	**Staff in-Charge**	:	R. Gayathri
Year/Sem/Sec	:	II / IV / B	**Due Date**	:	20.02.2026
Max. Marks	:	20	**Marks Obtained**	:	

Course Outcomes:

CO2 – Explain Angle Modulation Systems **(K2 – Understand)**
CO3 – Demonstrate Pulse Modulation and PCM **(K2 – Understand)**

Knowledge Level: K1–Remember, **K2**–Understand, **K3**–Apply, **K4**–Analyze, **K5**–Evaluate & **K6**-Create

Guidelines for Case Study Analysis

Students are required to analyze **any TWO case study problems** by adhering to the following guidelines. The objective is to promote real-world interpretation, analytical reasoning, and practical application of communication system concepts aligned with higher levels of Bloom's Taxonomy (Analyze–Evaluate).

1. **Identify and interpret the system:** Clearly specify the communication technique involved (AM/FM/PM/PCM/DM, etc.) and explain the given parameters and objectives.
2. **Apply theoretical concepts:** Use relevant formulas, principles, and derivations. Show clear calculation steps with proper units.
3. **Analyze system performance:** Evaluate key parameters such as bandwidth, modulation index, SNR, power efficiency, and noise impact.
4. **Support analysis using MATLAB (if applicable):** Simulate the system, generate required waveforms/spectra, and validate analytical results using plots or numerical outputs.
5. **Interpret and justify results:** Explain the practical significance of findings, justify design choices, and suggest improvements where necessary.

Case Study 1: FM Broadcasting Station

A community FM radio station operates at 101.2 MHz with a maximum frequency deviation of 75 kHz. The audio signal bandwidth is 15 kHz.

Questions:

1. Explain why FM is preferred over AM for this broadcast.
2. Determine whether the system operates under narrowband or wideband FM.
3. Calculate the approximate bandwidth using Carson's rule.
4. Describe how noise affects FM signals compared to AM signals.

Case Study 2: PM in Satellite Communication

A satellite communication system uses Phase Modulation (PM) to transmit telemetry data.

Questions:

1. Explain why PM is suitable for satellite communication.
2. Describe how PM differs from FM in terms of phase and frequency deviation.
3. Explain how FM can be generated using a PM modulator.
4. Identify practical challenges in PM demodulation.

Case Study 3: Two-Way Radio System

A police communication system uses Narrowband FM (NBFM).

Questions:

1. Explain why narrowband FM is chosen instead of wideband FM.
2. Describe the impact of modulation index on bandwidth.
3. Discuss the trade-off between bandwidth and noise immunity.
4. Explain the role of limiters in FM receivers.

Case Study 4: Hospital Patient Monitoring System

A hospital transmits ECG signals digitally using PCM.

Questions:

1. Explain why PCM is preferred for medical signal transmission.
2. Describe the stages involved in PCM generation.
3. Explain how quantization noise affects ECG quality.
4. Suggest methods to improve SNR in PCM.

Case Study 5: Digital Telephony System

A telephone company uses 8-bit PCM with a sampling rate of 8 kHz.

Questions:

1. Explain why 8 kHz sampling is chosen for voice signals.
2. Calculate the bit rate of the system.
3. Describe the effect of increasing quantization levels.
4. Compare PCM with Delta Modulation for voice transmission.

Case Study 6: Industrial Sensor Network

An industrial temperature monitoring system uses Pulse Width Modulation (PWM) for transmission.

Questions:

1. Explain how PWM represents analog information.
2. Compare PWM with PAM and PPM.
3. Discuss advantages of PWM in noisy industrial environments.
4. Explain how PWM signals can be demodulated.

Date of submission		**Signature of the faculty**	