Code No.: (R22EC402PC)	R22	H.T.No.			8	R					

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–II–Semester End Examinations (Supply) -December- 2025
ANALOG AND DIGITAL COMMUNICATIONS
(ECE)

[Time: 3 Hours] **[Max. Marks: 60]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 10 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(10 Marks)**

1.	a)	What are the main advantages of using SSB in communication systems?	[1M]
	b)	Define the Costas loop.	[1M]
	c)	Explain how the phase of the carrier signal varies in phase modulation based on the message signal.	[1M]
	d)	Compare AM and FM in terms of bandwidth requirements	[1M]
	e)	Explain the difference between direct and indirect methods of FM generation	[1M]
	f)	How does amplitude limiting affect the fidelity of modulated signals?	[1M]
	g)	Define Pulse Position Modulation (PPM)	[1M]
	h)	Define Delta Modulation (DM)	[1M]
	i)	Explain the modulation process in BPSK	[1M]
	j)	Discuss the advantages of using QPSK in bandwidth-limited communication systems.	[1M]

PART-B **(50 Marks)**

2.		Derive the expression for an amplitude modulated wave given a carrier signal $c(t)=A_c\cos(\omega_c t)$ and a message signal m(t).	[10M]
		OR	
3.		Explain the concept of envelope detection for AM signals. How does an envelope detector work?	[10M]
4.		Explain how the frequency of the carrier signal varies in FM based on the message signal.	[10M]
		OR	
5.	a)	Explain how a phase-locked loop (PLL) can be used to demodulate FM signals.	[5M]
	b)	For an FM signal with a carrier frequency of 1 MHz, a message signal frequency of 10 kHz, and a maximum frequency deviation of 50 kHz, calculate the bandwidth.	[5M]
6.	a)	Draw and explain the block diagram of a basic AM transmitter	[5M]
	b)	Explain the importance of power amplifiers in FM transmitters. What challenges are associated with amplifying FM signals?	[5M]
		OR	
7.		Design a band-pass IF filter for a superheterodyne receiver with an IF frequency of 455 kHz and a bandwidth of 10 kHz. Specify the filter characteristics and components.	[10M]

8.	Explain the generation PWM signal with a neat diagram.	[10M]
	OR	
9.a)	Explain the process of generating a PCM signal from an analog signal. Include the steps of sampling, quantization, and encoding.	[5M]
b)	Explain the concept of adapting the step size in Adaptive Delta Modulation (ADM) based on signal characteristics.	[5M]
10.	Describe the modulation scheme used in QAM. How are digital bits mapped to different combinations of amplitude and phase states?	[10M]
	OR	
11.	How does the phase of the carrier signal relate to the digital data being transmitted in BPSK? And Compare the spectral efficiency of QPSK with that of BPSK.	[10M]

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