R22 Regulation *Subject code:4E4DB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Regular/Supplementary Examinations, June 2026

ANALOG AND DIGITAL COMMUNICATIONS

(ECE)

Maximum Marks: 60 Date:10.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10X1M=10 Marks)		Marks	CO	BTL
1.a)	Write the standard time-domain equation of an amplitude modulated (AM) wave and define modulation index.	1M	1	3
b)	What is the role of the COSTAS loop in coherent detection of DSB-SC signals?	1M	1	2
c)	Write the mathematical expression for a single-tone FM wave and define modulation index.	1M	2	3
d)	Define pre-emphasis and de-emphasis. Why are they used in FM communication systems?	1M	2	2
e)	Classify transmitters based on modulation type and power level used in communication systems.	1M	3	3
f)	Why is the superheterodyne receiver preferred over the TRF receiver in practical radio reception?	1M	3	2
g)	Compare Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM).	1M	4	2
h)	What is companding?	1M	4	2
i)	Draw the basic block diagram of an ASK modulator.	1M	5	3
j)	What is coherent detection in ASK?	1M	5	2

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	Bloom Tx
2	Derive the frequency-domain representation of a single-tone AM wave. Draw the spectrum and explain the distribution of carrier power and sideband power.	10M	1	4
	OR			
3	a) Explain SSB modulation in time and frequency domains. b) Describe frequency discrimination and phase discrimination methods for SSB generation.	5M 5M	1	3
4	a) Explain the basic concepts of angle modulation. b) Derive the time-domain expressions for frequency modulation (FM).	3M 7M	2	3

	OR			
5	Explain the generation of FM signals using the Armstrong method with a neat block diagram. Discuss the role of crystal oscillator, phase modulator, and frequency multipliers.	10M	2	3
6	Explain the block diagram and operation of an FM receiver. Discuss the functions of limiter, discriminator, de-emphasis circuit, and AFC.	10M	3	3
	OR			
7	A superheterodyne receiver has an intermediate frequency of 455 kHz and receives a signal at 1200 kHz. (a) Calculate the local oscillator frequency for high-side injection (b) Determine the corresponding image frequency.	 5M 5M	3	4
8	a) Classify and define pulse modulation techniques. b) Explain the generation and characteristics of PWM with neat waveforms.	3M 7M	4	4
	OR			
9	A voice signal of bandwidth 4 kHz is transmitted using PCM with 256 quantization levels. (a) Determine the minimum sampling frequency (b) Find the number of bits per sample (c) Calculate the bit rate of the PCM system (d) If transmitted using Delta Modulation with one bit per sample, compare the bit rate with PCM.	10M	4	4
10	Explain the generation of Frequency Shift Keying (FSK) signals with a neat block diagram. Describe the operation of a non-coherent FSK detector and discuss its practical advantages.	10M	5	3
	OR			
11	Explain inter symbol interference (ISI) and its causes in baseband transmission. Discuss the use of eye diagrams in evaluating system performance.	10M	5	3