Reg. No

B.Tech DEGREE EXAMINATION, NOVEMBER 2023

Fifth Semester

18ECC205J - ANALOG AND DIGITAL COMMUNICATION

(For the candidates admitted during the academic year 2020 - 2021 & 2021 - 2022)

Note:

i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

ii. **Part - B** and **Part - C** should be answered in answer booklet.

Time: 3 Hours **Max. Marks: 100**

PART - A (20 × 1 = 20 Marks)

Answer **all** Questions

		Marks	BL	CO
1.	The baseband signal is preserved in the envelope of AM signal only if modulation index is (A) Less than 1 (B) Greater than 1 (C) Equal to 1 (D) Zero	1	2	1
2.	..... is used in television for transmission of picture signals. (A) DSB-SC (B) VSB (C) SSB-SC (D) FM	1	1	1
3.	An AM wave is given by $e_{AM} = 10(1 + 0.4\cos 10^3 t + 0.3\cos 10^4 t)\cos 10^6 t$. The modulation index of the envelope is ..... (A) 0.3 (B) 0.4 (C) 0.5 (D) 0.6	1	3	1
4.	A sinusoidal 400 Hz modulating signal of 2 V amplitude frequency modulates a carrier and produces 70 kHz frequency deviation. The frequency sensitivity is given by (A) 140 kHz/V (B) 70 kHz/V (C) 72 kHz/V (D) 35 kHz/V	1	3	1
5.	Pre-emphasis is done (A) For boosting of modulating signals at higher frequencies at transmitter (B) For boosting of modulating signals at lower frequencies at transmitter (C) During amplitude modulation (D) At the detected output of receiver	1	2	2
6.	The noise due to random behavior of charge carriers in active devices is (A) Shot noise (B) Partition noise (C) Industrial noise (D) Flicker noise	1	1	2
7.	Which one of the blocks is not common in both AM and FM receivers? (A) RF amplifier (B) Mixer (C) IF amplifier (D) Slope detector	1	1	2
8.	In a super-heterodyne receiver, the IF is 455 kHz. If it is tuned to a carrier frequency of 2500 kHz, the image frequency will be ..... (A) 2855 kHz (B) 3310 kHz (C) 1845 kHz (D) 3410 kHz	1	3	2
9.	Impulse response of a matched filter is _____ and delayed version of input signal. (A) Phase-reversed (B) Time-reversed (C) Frequency-reversed (D) Amplitude-reversed	1	2	3

10. Prediction filter is used in ----------. 1 1 3
(A) PCM (B) Delta modulation
(C) DPCM (D) PPM

11. A binary channel with bit rate R_b =36000 bps is available for PCM voice transmission. Find the quantizing level L. Assume f_m = 3.2 KHz. 1 3 3
(A) 8 (B) 16
(C) 32 (D) 128

12. The ---------- is a one bit version of DPCM. 1 1 3
(A) PCM (B) ADPCM
(C) DM (D) AM

13. Which of the following system has phase continuity? 1 2 4
(A) BPSK (B) DPSK
(C) BFSK (D) QPSK

14. Minimum Euclidean distance in QPSK system is 1 2 4
(A) 2E (B) $\sqrt{2}$E
(C) E/2 (D) $2\sqrt{2}$E

15. OQPSK stands for _____ 1 1 4
(A) Orthogonal Quadrature Pulse Shift Keying (B) Orthogonal Quadrature Phase Shift Keying
(C) Offset Quadrature Phase Shift Keying (D) Optical Quadrature Phase Shift Keying

16. A pair of sinusoidal waves differing only in phase by 180 degree is referred to ------. 1 1 4
(A) Anti symmetric signals (B) Antipodal signal
(C) Bipolar signal (D) Polar signal

17. Huffman coding is----------data compression algorithm. 1 1 5
(A) lossless (B) lossy
(C) maximal coding (D) ensemble

18. ---------- is minimal prefix code. 1 1 5
(A) Cryptographic coding (B) Shannon Fano
(C) Line coding (D) Lempelziv

19. In fast frequency hopping, the relation between symbol rate (R_s) and hop rate (R_h) is given as 1 2 5
(A) $R_h = n.R_s$ (B) $R_s = n.R_h$
(C) $R_h = R_s$ (D) $R_h = R_s/n$

20. Modulation and widening process in DSSS can be interchanged if and only if both are..... 1 2 5
(A) Non-linear (B) Linear
(C) Rational (D) Synchronous

PART - B (5 × 4 = 20 Marks) Marks BL CO
Answer **any 5** Questions

21. An amplitude modulated wave $20[1 + 0.4\cos 2\pi 10^3 t]\cos 2\pi.10^5 t$ is to be detected by a linear diode detector. Find the time constant τ and the value of resistance R if the capacitor is 200 pF. 4 3 1

22. Draw the block diagram to convert FM to PM and PM to FM. 4 2 1

23. What is an image signal? How can it be rejected? 4 2 2

24. Compare PWM and PPM. 4 4 3

25.	24 telephone channels, each band limited to 3.8 kHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of the PCM system for 128 quantization levels and 8 kHz sampling frequency.	4	3	3
26.	What is Quadrature Amplitude Modulation? Draw the signal constellation diagram for QAM.	4	1	4
27.	Explain the uses of the spread spectrum in CDMA.	4	2	5

PART - C (5 × 12 = 60 Marks)

Answer **all** Questions

		Marks	BL	CO
28.	(a) Explain the working principle of linear diode detector with a neat sketch and derive an expression for the optimum value of time constant RC.	12	2	1
	(OR)			
	(b) Draw and explain the circuit diagram of the Foster-Seeley discriminators. Also, give their demerits.			
29.	(a) Explain the operation of AM super-heterodyne receiver and write its merit over TRF. Why is it called super-heterodyne?	12	2	2
	(OR)			
	(b) Derive an expression for signal power and noise power of FM system and find its figure of merit for small noise case.			
30.	(a) 1. Explain in detail the transmitter and receiver of PCM with a neat diagram. [8 Marks]	12	3	3
	2. For the binary data sequence 1110010101, sketch the waveform of the formats (i) Bi-phase Mark and (ii) Bi-phase Level codes. [4 Marks]			
	(OR)			
	(b) Define matched filter. Explain how a matched filter can maximize SNR for a given transmitted symbol.			
31.	(a) Derive the probability of error for FSK also explain the generation and detection of binary FSK.	12	2	4
	(OR)			
	(b) With a neat diagram, explain the generation and detection of $\pi/4$ QPSK scheme.			
32.	(a) Compare and contrast slow and fast hopping systems. Also, explain the fast frequency hopping spread spectrum technique with neat diagram.	12	4	5
	(OR)			
	(b) A source emits seven symbols x_1, x_2,....,x_7 with respective probabilities 0.35, 0.3, 0.2, 0.1, 0.04, 0.005 and 0.005. Give Huffman coding for these symbols and find the average length of the code-word.			

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