B.Tech. DEGREE EXAMINATION, DECEMBER 2022
Fifth Semester

18ECC205J – ANALOG AND DIGITAL COMMUNICATION
(For the candidates admitted from the academic year 2018-2019 to 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** should be answered in answer booklet.

Time: 2½ Hours

Max. Marks: 75

PART – A (25 × 1 = 25 Marks)
Answer ALL Questions

	Marks	BL	CO	PO

1. Bandwidth required for SSB-EC modulation is — Marks 1, BL 1, CO 1, PO 1
   (A) fm (B) $2fm$
   (C) $fm/2$ (D) $fm/4$

2. The transmission efficiency of DSB-FC signal is — Marks 1, BL 1, CO 1, PO 1
   (A) 66.67% (B) 100%
   (C) 33.33% (D) 83.33%

3. A 100 MHz carrier is frequency modulated by 10 kHz wave for a frequency deviation of 75 kHz calculate the modulation index of FM signal — Marks 1, BL 2, CO 1, PO 2
   (A) 10 (B) 75
   (C) 90 (D) 7.5

4. An AM transmitter radiated 9 kWA wiuthout modulation and 10.125 kW after modulation. What is the modulation index? — Marks 1, BL 2, CO 1, PO 2
   (A) 0.8 (B) 0.5
   (C) 1 (D) 0.7

5. The frequency range of FM broadcast is — Marks 1, BL 1, CO 1, PO 1
   (A) 535-1605 kHz (B) 88-108 kHz
   (C) 88-108 MHz (D) 535-1605 MHz

6. A super heterodyne receiver if frequency is 455 kHz. The receiver is tuned to a carrier frequency of 2400 kHz. The image frequency will be — Marks 1, BL 2, CO 2, PO 2
   (A) 2855 kHz (B) 1845 kHz
   (C) 3310 kHz (D) 1490 kHz

7. _____ controls the amplitude fluctuations in FM receiver. — Marks 1, BL 1, CO 2, PO 1
   (A) Limiter (B) De emphasis
   (C) Master oscillator (D) Pre emphasis

8. The bandwidth of a base band signal with resonant frequency 560 kHz is 10 kHz. The Q factor of the tuned circuit is given by — Marks 1, BL 2, CO 2, PO 2
   (A) 45 (B) 55
   (C) 56 (D) 65

9. The selectivity of a radio receiver is
   - (A) Its ability to reject unwanted signals
   - (B) Its ability to detect the weakest possible signal
   - (C) Its ability to reproduce all frequency components in modulating signal
   - (D) Its ability to amplify weak signals

10. The noise voltage V_n and absolute temperature T are related as
    - (A) $V_n = 1/\sqrt{4KTRB}$
    - (B) $V_n = \sqrt{4KTRB}$
    - (C) $V_n = 4KTRB$
    - (D) $V_n = \dfrac{\sqrt{4KTB}}{R}$

11. Calculate the minimum sampling rate to avoid aliasing when a continuous time signal is given by $x(t) = 5\cos 600\pi t$
    - (A) 200 Hz
    - (B) 500 Hz
    - (C) 400 Hz
    - (D) 600 Hz

12. _____converts quantized pulses into bits.
    - (A) Sampler
    - (B) Quantizer
    - (C) Encoder
    - (D) Decoder

13. The height of the eye opening at a specified sampling time, defines the _____
    - (A) The sensitivity of the system to timing errors
    - (B) Time interval over which the required signal can be sampled without error from ISI
    - (C) Noise margin of the system
    - (D) Time interval over which the received signal can be sampled with error from ISI

14. A PCM system uses a uniform quantizer followed by a 7 bit encoder, the maximum BW of the message signal for which this system operates is 3.57 MHz. What is the system bit rate?
    - (A) 25 Mbps
    - (B) 20 Mbps
    - (C) 50 Mbps
    - (D) 14 Mbps

15. The slope overload distortion occur in delta modulation when
    - (A) Step size is too small
    - (B) Input waveform varies slowly
    - (C) Step size is too large
    - (D) Bandwidth is too large

16. On a 32 QAM constellation diagram each constellation point represent a
    - (A) Bit
    - (B) Quad bit
    - (C) Pentabit
    - (D) Dibit

17. The data rate of QPSK is _____of BPSK.
    - (A) Thrice
    - (B) Four times
    - (C) Same
    - (D) Twice

13DA5-18ECC205J

18. _____is also called as ON-OFF keying (OOK).

    (A) PSK   (B) ASK

    (C) FSK   (D) QPSK

19. How many input bits are required for 8-QAM?

    (A) 2   (B) 3

    (C) 4   (D) 8

20. If the desired transmission bit rate for a coherent FSK system is 5 Kbps, the best possible interval between the carriers is

    (A) 0.5 msec   (B) 0.2 msec

    (C) 0.25 msec   (D) 0.4 msec

21. The code efficiency is given by

    (A) 1– Redundancy   (B) 1+Redundancy

    (C) 1/Redundancy   (D) 2 Redundancy

22. The period of PN sequence produced by a linear 5 stage shift register cannot exceed _____symbols.

    (A) 10   (B) 5

    (C) 32   (D) 31

23. DSSS system, spreads the baseband signal by _____ the base band pulses with a pseudo noise sequence.

    (A) Adding   (B) Subtracting

    (C) Multiplying   (D) Dividing

24. The minimum distance of an $(n,k)=(7,4)$ linear block code is upper bounded by

    (A) 1   (B) 2

    (C) 3   (D) 4

25. Which filter is used to get the final FHSS signal?

    (A) Low pass filter   (B) High pass filter

    (C) Band pass filter   (D) Band reject filter

PART – B (5 × 10 = 50 Marks)
Answer ALL Questions

Marks   BL   CO   PO

26. a.i. Construct the circuit diagram of collector modulator and explain its principle of operation.

    ii. A modulating signal $20\sin 2\pi 10^3 t$ is used to amplitude modulate a carrier signal $40\sin 2\pi 10^4 t$. Determine the modulation index, frequencies of the sideband components and their amplitudes.

(OR)

13DA5-18ECC205J

b.i. Elaborate the operation of Foster Seeley discriminator with suitable circuit diagram.   6   3   1   1

ii. The maximum deviation allowed in an FM broadcast system is 75 kHz. If the modulating signal is a single tone sinusoid of 20 kHz. Find the bandwidth of the FM signal. What will be the change in the bandwidth if modulating frequency is doubled? Determine the bandwidth when modulating signals amplitude is also doubled.   4   3   1   2

27. a. Describe in detail about the constituent stages of an AM superheterodyne receiver.   10   3   2   1

(OR)

b. A single tone modulating signal $f(t)$ frequency modulates a carrier $A\cos w_c t$. Show that figure of merit γ_{FM} is given by   10   3   2   2

$$\gamma_{FM} = \frac{3k_f^2 \overline{f^2(t)}}{W_m^2}$$

28. a. Construct the block diagram of PCM transmitter and receiver. Explain its operation.   10   3   3   1

(OR)

b. Derive the signal to noise ratio for a matched filter and obtain an expression for optimum filter response.   10   3   3   4

29. a. Construct the block diagram of QPSK transmitter and receiver and explain.   10   3   4   1

(OR)

b. Describe the generation and detection of QAM with neat block diagram.   10   3   4   1

30. a. A DMA has five symbols S_0, S_1, S_2, S_3, S_4 with probabilities 0.4, 0.19, 0.16, 0.15, 0.15 respectively. Construct a Shannon-Fano code for the source and calculate the entropy, average code length and efficiency.   10   3   5   2

(OR)

b. Explain the working of direct sequence spread spectrum with relevant diagrams.   10   3   5   1

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13DA5-18ECC205J