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Question Paper Code : 30144

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

## Fourth Semester

# Computer and Communication Engineering

EC 3491 — COMMUNICATION SYSTEMS

(Common to Electronics and Communication Engineering/Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is modulation?
2. What is the Hilbert Transform of an impulse function,  $\delta(t)$ ?
3. Define sampling theorem.
4. What is use of a compander?
5. Write the properties of Line coding.
6. Write the advantages of delta modulation over PCM.
7. What are the bandpass digital modulation techniques?
8. Draw constellation diagram of 8-QAM.
9. Define correlation receiver.
10. What is the meaning of the term "likelihood" in maximum likelihood decoding?

PART B — (5 × 13 = 65 marks)

11. (a) A DSB-SC signal is to be generated with a carrier frequency  $f_c = 1$  MHz using a non-linear device with input-output relation given by  $V_o = a V_i + b V_i^3$ , where  $a$  and  $b$  are constants. The output of the non-linear device is filtered by a band pass filter. Let the  $V_i = A_c \cos(2\pi f_c t) + m(t)$ , where  $m(t)$  is the message signal. Then, calculate the value of  $f_c$ .

Or

- (b) Calculate the Hilbert Transform of the function,  $f(t) = \cos(\omega_1 t) + \sin(\omega_2 t)$ .
12. (a) A message signal of  $10 \cos[(4\pi \times 10^3)t]$  is transmitted through PCM system. If sampling frequency equal to twice the Nyquist rate, and signal to quantization noise ratio (SQNR) should be minimum of 22 dB, then find the transmission bandwidth and SQNR in dB. (13)

Or

- (b) Calculate the Nyquist sampling rate for the signal given below :

$$x(t) = \frac{\sin(100\pi t) \cdot \text{sinc}(200t)}{\pi t}$$

13. (a) Explain in detail viterbi decoders.

Or

- (b) Explain DPCM transmitter and receiver in detail.
14. (a) What is difference between M-ary QAM and M-ary PSK? Explain it using constellation diagram for different values of  $M = 2, 4$  and  $16$ .

Or

- (b) A message signal of  $10 \cos[(2\pi \times 10^4)t]$  is given to 1024 level PCM system. The resulting signal is transmitted through free space by using binary signaling technique. Find the transmission bandwidth if modulation technique is (i) ASK and (ii) BPSK. (6+7)
15. (a) What is matched filter receiver? Derive the expression for impulse response of a matched filter receiver. (3+10=13)

Or

- (b) What is Intersymbol Interference (ISI)? What are the ways to reduce ISI? Discuss in detail. (5+8=13)