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**Question Paper Code : 80117**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third Semester

Information Technology

EC 8394 — ANALOG AND DIGITAL COMMUNICATION

(Regulation 2017)

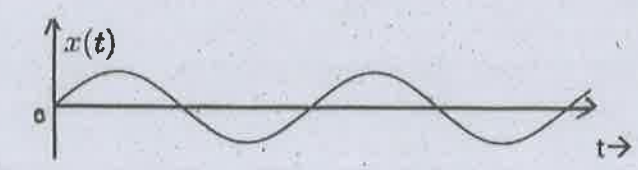
Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for modulation?
2. Plot the FM waveform for the given message signal using a sine wave carrier.



3. List out the standard organizations for data communication.
4. Draw the BPSK signal for the given input bit stream 101010.
5. Define Quadrature amplitude modulation.
6. Identify the steps in pulse code modulation.
7. Write down the expression for entropy.
8. State the properties of cyclic code.
9. Brief the significance of frequency reuse.
10. What is Bluetooth technology?

PART B — (5 × 13 = 65 marks)

11. (a) One input of an AM modulator is a 500 kHz carrier with peak amplitude of 20 Vp. The second input is a 10 kHz modulating signal that is of sufficient amplitude to cause a peak change in the output wave of ± 7.5 V. Determine the following : (13)
- Lower and upper side frequencies
  - Modulation index
  - The peak amplitude of the modulated carrier, the upper and lower side frequencies
  - Maximum and minimum amplitudes of the AM envelope
  - The expression for the modulated AM wave.

Or

- (b) (i) Outline the generation of SSB wave using phase shift method with necessary block diagram. (9)
- (ii) Determine the peak frequency deviation and modulation index (m) for an FM modulator with a deviation sensitivity  $K_1 = 5 \text{ kHz/V}$  and a modulating signal  $V(t) = 2 \cos(2\pi 2000t)$ . (4)
12. (a) Summarize the generation and demodulation of PAM signal with necessary waveforms. (13)

Or

- (b) List out the various data communication codes, that are popularly employed. Also analyse the merits and demerits of them. (13)
13. (a) Demonstrate the modulation and demodulation of BFSK signal with necessary block diagram and waveforms. (13)

Or

- (b) (i) Draw the block diagram of QPSK modulator and explain its working. (7)
- (ii) Compare and contrast various digital modulation techniques. (6)
14. (a) A source alphabet has five messages  $\{A_0, A_1, A_2, A_3, A_4\}$  with probabilities  $\{0.4, 0.3, 0.15, 0.1, 0.05\}$  respectively. Determine the coding efficiency using (i) Binary Code (ii) Shannon — Fano coding. (13)

Or

- (b) State the relationship between mutual information and channel capacity and also derive the expression for mutual information. (13)

15. (a) (i) Briefly describe the function of GSM radio subsystem. (5)
- (ii) Outline the principles of channel assignment and handover techniques in CDMA. (8)

Or

- (b) Draw and explain the working of satellite uplink and downlink model with necessary block diagram. (13)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Consider an angle modulated signal (9)
- $$x(t) = 3 \cos[2\pi 10^6 t + 2 \sin(2\pi 10^3 t)].$$
- Find its (1) Instantaneous frequency at time  $t = 0.25 \text{ ms}$  and  $t = 0.5 \text{ ms}$  (2) Maximum phase deviation and (3) maximum frequency deviation.
- (ii) Bring out the functions of serial and parallel interfaces in data communication. Examine the reasons for why two interfaces are required? (6)

Or

- (b) The parity check matrix  $H = \begin{pmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{pmatrix}$  of a linear (7,4) block code is given as follows.
- (i) Show how data words (1) 0011, (2) 0100 and (3) 0101 are coded.
- (ii) Show how error is detected when 2<sup>nd</sup> bit is detected erroneously for data word 0011. (15)