

**B.Tech. SEM -V (E & TC Engg.) 2014 Course (CBCS) : WINTER - 2018**  
**SUBJECT : DIGITAL COMMUNICATION**

Day Tuesday  
Date: 27/11/2018

W-2018-2437

Time : 02.30 PM TO 05.30 PM  
Max. Marks : 60

**N. B. ;**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labeled diagram **WHEREVER** necessary.
- 4) Assume suitable data, if necessary.

- Q.1**
- a) What is PCM? Explain with neat block diagram. (06)
  - b) 24 telephone channels, each band limited to 3.7 KHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of PCM system for 130 quantization levels and an 10 KHz sampling frequency. (04)

**OR**

- a) What are the errors in delta modulation and how they are overcome by adaptive delta modulation (ADM)? (06)
  - b) Write a short note on companding (04)
- Q.2**
- a) Random variable Z is a function of another random variable X in a such way that  $Z = \cos(X)$  and X is uniformly distributed in interval  $(-\pi, \pi)$ . (06)

$$f_X(X) = \begin{cases} \frac{1}{2\pi} & \text{for } -\pi < X < \pi \\ 0 & \text{otherwise} \end{cases}$$

Determine mean value of Z

- b) Define for random variable: (04)
  - i) Mean
  - ii) Mean Square
  - iii) Standard Deviation
  - iv) Variance

**OR**

- a) Random variable X has uniform distribution: (06)

$$f_X(X) = \begin{cases} \frac{1}{2\pi} & \text{for } 0 \leq X \leq 2\pi \\ 0 & \text{otherwise} \end{cases}$$

Determine  $m_X, \bar{X}^2, \sigma_X$

- b) Define the terms: (04)
  - i) Ergodic process
  - ii) Ensemble average

P. T. O.

- Q.3 a)** 1010110011 for the given data draw the following line codes: (06)
- i) Unipolar RZ
  - ii) Polar RZ
  - iii) AMI
  - iv) Split phase Manchester
  - v) Polar quaternary
  - vi) Unipolar NRZ
- b)** State properties of line codes. (04)
- OR**
- a)** Write short note on scrambler and descrambler (06)
- b)** Draw and explain power spectra of different line codes. (04)
- Q.4 a)** Binary data 0010010011 needs to be transmitted using DPSK. Prove that reconstruction of DPSK is independent of choice of extra bit. (06)
- b)** Write a short note on minimum shift keying (04)
- OR**
- a)** Explain coherent binary PSK System. (06)
- b)** Explain block diagram of ASK generator with neat waveforms. (04)
- Q.5 a)** Derive expression for probability of error of matched filter. (06)
- b)** Write short on optimum filter (04)
- OR**
- a)** Derive equation for error of probability of BPSK. (06)
- b)** Write short note on integrate and dump filter (04)
- Q.6 a)** Draw neat circuit diagram to generate maximum length sequence using linear feedback shift register of length  $m=5$  with feedback taps [5,2]. Find generated output sequences if initial contents of SR are [10000]. if chip rate is  $10^7$  chips/sec, calculate chip and PN sequence duration and period of output sequence. (06)
- b)** What is spread spectrum techniques and how it is classified? (04)
- OR**
- a)** Compare FDMA, TDMA and CDMA. (06)
- b)** A PN sequence generator makes use of its shift registers and has a chip rate of 12 MHz. Sketch the waveforms for autocorrelation function and power spectral density for PN sequence. (04)

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