

Total No. of Questions : 8]

SEAT No. :

**P2952**

[Total No. of Pages : 3

**[5669]-541**

**T.E. (E & TC)**

**DIGITAL COMMUNICATION**

**(2015 Pattern) (Semester - I)**

**Time : 2½ Hours]**

**[Max. Marks : 70**

**Instructions to the candidates:**

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Assume suitable data if necessary.
- 3) Figures to the right side indicate full marks.

**Q1) a)** What is narrowband noise? Show the generation of narrowband noise from its in phase and quadrature components. [6]

**b)** A binary channel with 32kbps bit rate is available for PCM voice transmission. Find [6]

- i) No. of quantization levels
- ii) No. of bits per sample
- iii) sampling frequency

The voice signal is bandlimited to 3.4KHz.

**c)** What is bit synchronization? Explain Early-Late bit synchronizer in detail. [8]

OR

**Q2) a)** List properties of Line Codes (Data Formats). Draw the following line codes for bit stream 10110010 [8]

- i) Polar RZ
- ii) Polar NRZ
- iii) Manchester
- iv) AMI
- v) Polar Quaternary
- vi) Unipolar RZ

**b)** What is White noise? Explain. [6]

**c)** With the help of neat block diagram, explain Pulse Code Modulation. [6]

**P.T.O.**

**Q3) a)** Explain likelihood function. [6]

**b)** Derive an expression for probability of error of matched filter. [8]

**c)** State properties of Match filter. [2]

OR

**Q4) a)** Derive an expression for signal to noise ratio of integrator and dump filter. [6]

**b)** Find impulse response of matched filter whose input is given by [6]

$$g(t) = A \sin(2\pi f_c T) ; 0 \leq t \leq T$$

= 0; Otherwise

**c)** Draw block diagram and explain in detail correlation receiver. [4]

**Q5) a)** Draw block diagram of BPSK and explain it. [4]

**b)** With the help of block diagram and waveforms, explain generation of coherent BFSK. [6]

Binary data is transmitted using PSK at a rate 5Mbps over RF link having bandwidth 10 MHz. Find signal-power required at receiver input so that error probability is less than or equal to  $10^{-4}$  watt/Hz.  $Q(3.71) = 10^{-4}$ ,  $N_0/2 = 10^{-10}$ . [6]

OR

**Q6) a)** Compare BPSK, BFSK, QPSK w.r.t. [6]

i) BW

ii) Probability of Error

iii) Bit Rate

**b)** Draw block diagram and Explain generation of QPSK with waveforms. [6]

**c)** Explain M-ary QAM transmitter and receiver. [4]

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- Q7) a)** Define [4]
- i) Processing Gain
  - ii) Jamming Margin
- b) The DSSS communication system has message bit duration ( $T_b$ ) = 4.095ms and chip duration ( $T_c$ ) = 1  $\mu$ s. Calculate the processing gain and jamming margin if ( $E_b/N_o$ ) = 10 and the average probability of error  $P_e = 0.5 \times 10^{-3}$  [6]
- c) Draw the block diagram of DSSS system and explain various blocks. [8]

OR

- Q8) Write short note on** [18]
- i) FHSS
  - ii) Properties of PN sequence
  - iii) Fast and slow frequency hopping