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 to3.4KHz.

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]**

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

$= 0$; 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 gneneration 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. $Q(3.71) = 10^{-4}$, $No/2 = 10^{-10}$. **[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]**

Q7) a) Define **[4]**

i) Processing Gain

ii) Jamming Margin

b) The DSSS communication system has message bit duration (Tb) = 4.095ms and chip duration(Tc) = 1 μs. Calculate the processing gain and jamming margin if (Eb/No) = 10 and the average probability of error $P_e = 0.5 \times 10^{-5}$ **[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

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