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Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, April 2014
(2008 Scheme)
08.604 : DIGITAL COMMUNICATION (T)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions. **(10×4=40 Marks)**

1. State the sampling theorem. What is the importance of Nyquist rate of sampling ?
2. What is companding ? Explain the companding laws, which law is followed in India and the value of constant.
3. What is differential encoding ? State its advantages.
4. List the various sampling techniques. What is aperture effect ? How it can be overcome ?
5. Describe maximum likelihood receivers.
6. Relate probability of error, processing gain and jamming margin with respect to spread spectrum communication.
7. Binary data is transmitted at a rate of 1 Mbps over a channel having bandwidth 3 MHz. Assume that the noise PSP at the receiver is $\frac{NO}{2} = 10^{-10}$ watts / Hz . Find the average carrier power required at the receiver input for DPSK signalling schemes to maintain a probability of error Pe = 10^{-4}. Let erfc associated with this error is 2.6.
8. What is the difference between FSK and PSK ? Which digital modulation technique gives better error probability when ASK, PSK and FSK are compared ?

P.T.O.

9. Obtain signal to noise power of a direct sequence spread spectrum if

   Data sequence bit duration = 4.095 ms

   Processing gain = 4095.

   Eb/No = 10 No/2 = 10^{-10} watts/Hz.

10. Define :

    a) Coherence time

    b) Coherence bandwidth.

PART – B

Answer **any 2** questions from **each** Module. **(6×10=60 Marks)**

Module – 1

11. a) A signal g(t) = 2 cos 400 πt + 6 cos 640 πt is sampled at fs = 500 Hz. If the sampled signal is passed through an ideal lowpass filter with a cutoff frequency of 400 Hz, what frequency components will appear in the filter output ? Draw the sampled spectrum.

    b) Determine the Nyquist rate and the Nyquist sampling interval for the following signals.

       a) g, (t) = sine (100 πt).

       b) g(t) = 20 cos (80 πt) cos (220 πt).

12. For the sinusoidal modulating signal x(t) = $A_\circ$ cos 2π fot. Show that the output signal to quantisation ratio in a delta modulated system under the assumption of no slope overload error is given by $\frac{3f_s^3}{8\pi^2 f_o^2 f_M}$ where f_s sampling frequency and f_M = cutoff frequency of the LPF at the receiver.

13. a) Draw the block schematic of DPCM transmitter and receiver and explain.

    b) Explain how the problems associated with DPCM overcome in ADPCM.

Module – 2

14. a) Describe the generation and demodulation of FSK.

    b) Derive the average probability of error in FSK.

15. Apply Gram-Schmidt procedure to obtain an orthonormal basis for the signals.

    $s_1(t) = 3 \quad 0 \leq t \leq 4$, is 0 otherwise

    $s_2(t) = 3 \quad 0 \leq t \leq 2$, is 0 otherwise

    $s_3(t) = 3 \quad 2 \leq t \leq 4$, is 0 otherwise, Express the signals $s_1(t)$, $s_2(t)$, $s_3(t)$ in terms of orthonormal basis function. Also give the signal constellation.

16. Describe the detection of signals with unknown phase.

Module – 3

17. a) Describe a direct sequence spread spectrum transmitter and receiver with block diagram.

    b) In a direct sequence spread-spectrum modulation scheme, a 14 stage linear feedback shift register is used to generate PN code sequence to find the period of code sequence and processing gain.

18. a) Derive the expression for Jamming margin.

    b) Obtain the Jammy margin if Bit duration = 2.095 ms, chip duration = 1 μ s. Eb/No = 10.

19. Explain the method of generating pseudo noise sequences (PN). State and verify the properties of PN sequence generated.
