SHRI SANT GADGE BABA COLLEGE OF ENGINEERING & TECHNOLOGY, BHUSAWAL

Department of Electronics & Communication Engineering

Subject: Digital Communication (DC)

TE (E&C)-SEM-I

UNIVERSITY PAPER QUESTIONS BANK

UNIT-I

* Nov/Dec-2007 *

1. Explain in brief

i) Parseval's Power Theorem.

ii) Rayleigh's Energy Theorem.

iii) Power Spectral Density.

iv) Energy Spectral Density.

v) Aliasing Error. **10**

2. Find Nyquist interval & Nyquist rate for the signal

m (t) = 1/2π cos (4000 π.t.). cos (1000 π.t.) **10**

3. With Neat Derivation Explain Flat-Top Sampling. Explain Aperture Effect & How It is removed. **10**

* April/May-2008 *

4. State & prove Rayleigh's Energy Theorem & find the energy in the signal

V (t) = sin c2wt. **10**

5. Enlist the Properties of ESD, PSD & Fourier transform. **10**

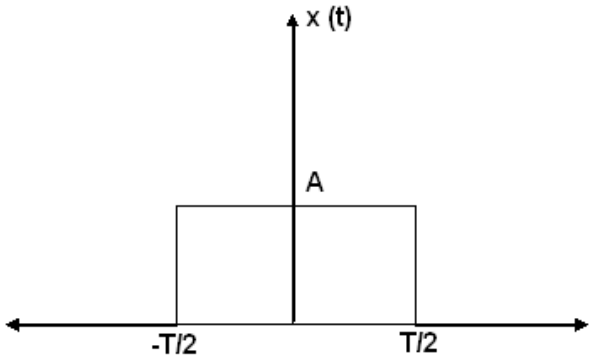
6. State & prove Sampling Theorem. What is Aliasing? **10**

* Nov/Dec-2008 *

7. Prove that if a band limited signal x (t) is sampled through Natural sampling then the resultant spectrum of samples is given by

$S(f) = \tau A / T_S \ \Sigma \sin c\ (nf_S \tau) \times (f - nf_S)$. Hence draw the spectrum. **10**

8. Obtain the Fourier transform of rectangular pulse of duration T sec. & amplitude 'A' as shown



Draw the amplitude spectrum. **10**

9. What is auto correlation of energy signals? State & prove properties of autocorrelation of energy signals. **10**

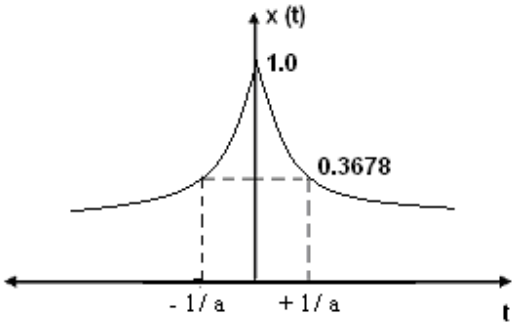
* April/May-2009 *

10. State & prove following properties of Fourier transform.

i) Multiplication in time domain.

ii) Convolution in time domain. **10**

11. Obtain Fourier transform of the figure shown & draw amplitude spectrum. **10**



12. A band limited signal x (t) is sampled naturally by a train of rectangular pulse of width τ & period T_S. Find an expression of sampled signal in time & frequency domain. Draw the spectrum of sampled signal. **10**

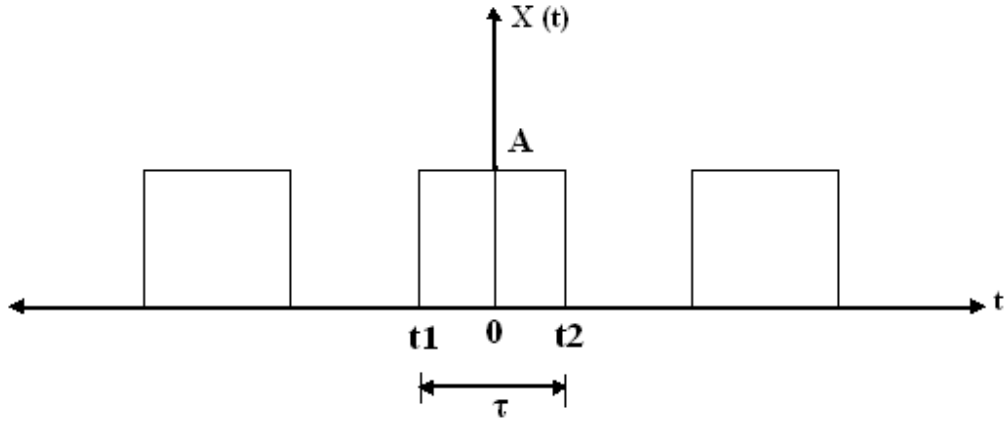
* Nov/Dec-2009 *

13. State & prove Sampling Theorem. Explain Aperture effect. **10**

14. State the Rayleigh's Energy Theorem & Parseval's Theorem. Explain any one property of

Fourier transform. **10**

15. Obtain the Fourier transform of a periodic gate function of amplitude A, period T_0 & width τ assuming that the function is centered around the origin. Draw its amplitude spectrum. **10**



* April/May-2010 *

16. Find out the Fourier transform of the following functions:

i) Sin ($2 \pi f_c t$)

ii) x (t) Cos ($2 \pi f_c t + \Phi$) **10**

17. State & prove Sampling theorem for band limited signals. Draw the necessary spectrums of samples for different sampling conditions. **10**

18. Give the detail statement & prove the following:

i) Convolution theorem

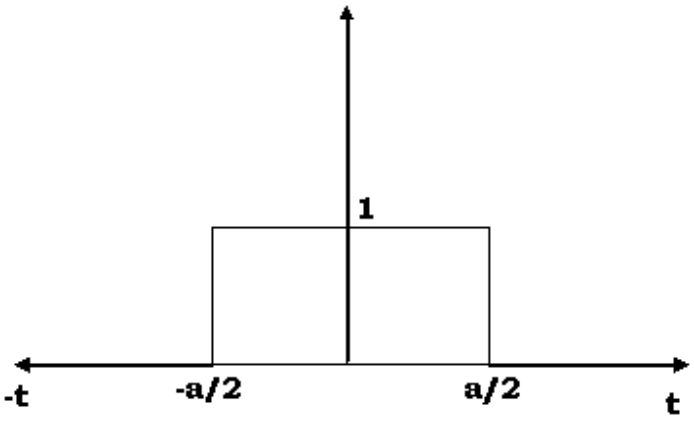
ii) Rayleigh's Energy Theorem **10**

* Nov/Dec-2010 *

19. State & prove Parseval Power Theorem. **10**

20. What is Natural Sampling? Derive the spectrum of naturally sampled signal. **10**

21. Find the Fourier transform of rectangular pulse as shown in figure bellow. Sketch amplitude & phase spectrum. **10**



* April/May-2011 *

22. A band limited signal x (t) is sampled by a train of pulses with width τ & period T_S seconds to generate flat top samples. Derive the equation of sample in time & frequency domain. What is drawback in flat top sampling? **10**

23. State & prove following properties of Fourier transform.

i) Integration in time domain.

ii) Convolution. **10**

24. Obtain the fourier transform of a cosine wave having a frequency fo & peak amplitude of unity & plot its spectrum. **10**

* Nov/Dec-2011 *

25. State & prove following properties of Fourier transform.

i) Multiplication in time domain.

ii) Frequency shifting. **10**

26. Explain types of sampling & Aperture effect. **10**

27. Describe Rayleigh's Energy theorem with the statement. **10**

* April/May-2012 *

28. What is cross correlation of signal? State & prove its properties. **10**

29. What is aliasing? Explain the effect of aliasing with neat diagram in time & frequency domain. How aliasing can be avoided. **10**

30. State & prove Parseval's & Rayleigh's theorem. **10**

* Nov/Dec-2012 *

31. State & prove Sampling theorem in Time Domain. **10**

32. Explain any two properties of Fourier transform with proof. **10**

33. A low pass signal of 3 KHz BW & amplitude over -5V to 5Vrange is sampled at Nyquist & converted to 8 bit PCM using uniform quantization. The mean squared value of message signal is 2 Volt squared. Calculate:

i) The normalized power for quantization noise.

ii) The bit transmission rate.

iii) The signal to quantization noise ratio in db. **10**

* April/May-2013 *

34. State & prove the following with reference to Fourier's transform.

i) Multiplication in time domain.

ii) Convolution in time domain. **10**

35. State & prove Rayleigh theorem. **10**

36. A low pass signal of limited bandwidth of 4 KHz, swinging between -5V to +5V, sampled at Nyquist rate is uniformly quantized using 8 bit PCM. The mean square value of signal is 2V. Calculate:

i) Normalized power for Quantization Noise.

ii) Bit transmission rate.

iii) SNR in dB. **10**

UNIT-II

* Nov/Dec-2007 *

1. State & prove Central Limit Theorem. **10**

2. Explain Cumulative Distribution Function (CDF) & Probability Distribution Function (PDF) along with its properties. **10**

3. A card is drawn at random from an ordinary desk of 52 playing cards. Find the probability of its being.

a) An ace

b) A heart

c) A six or A heart

d) Neither A nine nor a spade. **10**

* April/May-2008 *

4. Show that mean & variance of random variable 'X' having a uniform distribution in the Interval [a, b] are $m_x = a + b / 2$ & $S^2_x = (a – b)^2 / 12$. **10**

5. There are two identical boxes 'X' & 'Y'. Box 'X' contains 4 white & 3 red balls & Box 'Y' contains 3 white & 7 red balls. One ball is drawn at random from the box. If the ball is white. What is the probability that is drawn from box 'X'. **10**

6. State & prove Central Limit Theorem. **10**

* Nov/Dec-2008 *

7. A random variable has a density function

$f_X(x) = x\, e^{-x2/2}$ $x \geq 0$

$= 0$ $x < 0$

i) Find distribution function $F_X(x)$

ii) Find $P(0.5 < X \leq 2)$. **10**

8. Show that for a binomial distribution mean = np & variance = npq

= np (1 - p). **10**

9. An urn contains 5 white & 3 green balls. Another urn contains 3 white & 7 green balls. Two balls are chosen at random from first urn & put into second urn. Then a ball is drawn from second urn. What is the probability that it is a white ball? **10**

* April/May-2009 *

10. A certain random variable has the CDF.

$$F_X(x) \begin{cases} = 0 & x < 0 \\ = kx^2 & 0 \le x \le 10 \\ = 100k & x > 10 \end{cases}$$

i) Evaluate the value of k.

ii) Find P ($X \le 5$), P ($5 < X \le 7$).

iii) Plot the corresponding PDF. **10**

11. Let X be uniform distribution given by

$f_X(x) = 1/2\pi \quad 0 < x \le 2\pi$

$= 0 \quad$ elsewhere

calculate mean, moment, mean square value & variance of above distribution. **10**

12. With reference to random process explain the following.

i) Ensemble Averages.

ii) Time Averages.

iii) Stationary Random process.

iv) Ergodic process. **10**

* Nov/Dec-2009 *

13. Define:

i) Continuous random variable.

ii) Stationary & Ergodic random process.

iii) Random process.

iv) Time & Ensemble Average of random variable.

v) Probability density function of a random variable with suitable illustrations. **10**

14. Explain Binomial, Poisson, Gaussion models of Probability Distributions of random variables. **10**

15. In a factory, four machines A_1 A_2, A_3 & A_4 produce 10 %, 20 %, 30 % & 40 % of the items respectively. The percentage of the defective items produced by them is 5 %, 4 %, 3 % & 2 % respectively. An item selected at random is found to be defective

i) What is the probability that it was produced by machine A_2 ?

ii) What is the probability that it was produced by machine A_3 ?

iii) What is the probability that it was produced by machine A_1 ? **10**

* April/May-2010 *

16. Two factories produce identical clocks. The production of first factory consist of 10,000 clocks of which 100 are defective. The second factory produces20, 000 clocks of which 30 are defective. What is the probability that a particular defective clock was produced in the first factory? **10**

17. Show that mean & variance of random variable 'X' having a uniform distribution in the Interval [a, b] are $m_x = a + b / 2$ & $\sigma^2_x = (a - b)^2 / 12$. **10**

18. What is meant by random processes? Explain in brief with reference to random process discuss

i) Stationary & non-stationary random process.

ii) Ergodic process. **10**

* Nov/Dec-2010 *

19. In a certain city, 50% population drive to work, 30% takes the subway & 20% takes the bus. The probability of being late for those who drive is 10%, for those who takes the subway is 3% & for those who takes the bus is 5%.

i) What is the probability that an individual in this city will be late for work?

ii) If an individual is late for the work, what is the probability that he drive to work? **10**

20. A certain random variable has

$$F_X(x) = \begin{cases} 0 & x \le 0 \\ kx^2 & 0 \le x \le 10 \\ 100k & x > 10 \end{cases}$$

Find i) k. ii) Find $P(X \le 5)$. iii) $P(5 < X \le 7)$. **10**

21. What do you mean by PDF? State its properties. Explain Gaussian PDF. **10**

* April/May-2010 *

22. A lot consist of 10 good articles, 4 with minor defects & 2 with major defects. Two articles are chosen from the lot at random (without replacement). Find the probability that

i) both are good

ii) both have major defects

iii) at least one is good

iv) at most one is good

v) exactly one is good **10**

23. If the density function of continuous random variable is given by

$f(x) = ax \quad 0 < x < 1$

$= a \quad 1 \leq x \leq 2$

$= 3a - ax \quad 2 \leq x \leq 3$

$= 0$ elsewhere

i) find the value of a. ii) find the CDF of x. iii) find $P(X \geq 1.5)$. **10**

24. explain the following processes.

i) Random

ii) Wide sense stationary

iii) Strict sense stationary

iv) Ergodic **10**

* Nov/Dec-2011 *

25. Explain Ergodic process differentiates with stationary process. **10**

26. A card is drawn at random from an ordinary desk of 52 playing cards. Find the probability of its being.

i) An ace

ii) Neither eight nor spade

iii) A heart

iv) A seven or a heart

v) A diamond **10**

27. Explain Binomial & Normal Distribution of probabilities. **10**

* April/May-2012 *

28. For the random variable 'X' having uniform distribution in the interval [a, b] find mean & variance. **10**

29. What is PDF? State & explain its properties. **10**

30. In an experiment of tossing a coin three times & observing the sequence of Head & Tail's find the probabilities of event A, B, C. Where event ABC are

A = outcome is two head.

B = second toss differ from other two.

C = first two toss match.

Also find P (AB) & P(A+B). **10**

* Nov/Dec-2012 *

31. Two factories produce identical clocks. The production of the first factory consist of 10, 000 clocks of which 300 are defective. What is the probability that a particular defective clock was produced in the first factory. **10**

32. Explain:

i) Random Process.

ii) Stationary process & Ergodic process. **10**

33. Write short notes on:

i) Binomial Distribution.

ii) Poisson Distribution. **10**

* April/May-2013 *

34. Describe the probability model like Rayleigh & Gaussian. **10**

35. Explain Gaussian Process & Stochastic process. **10**

36. Explain the properties of conditional pdf. **10**

UNIT-III

* Nov/Dec-2007 *

1. A television signal with a bandwidth of 4.2 MHz transmitted using binary PCM. The number of quantization levels is 512. Calculate:

i) Code Word Length

ii) Transmission Bandwidth

iii) Final bit rate

iv) Output signal to noise ratio. **10**

2. Explain in detail scrambler & unscrambler. **10**

3. List various encoding methods (Digital formats) used in digital signal transmission with appropriate wave patterns (any five patterns). **10**

* April/May-2008 *

4. Draw & explain bit synchronization, Early & Late synchronization. **10**

5. With neat diagram explain Delta Modulation. What are the disadvantages of it. **10**

6. If a binary channel with of r_b = 36 kbps is available for PCM voice transmission. Find appropriate values of number of bits, quantization levels & sampling frequency if w = 3.2 KHz. **10**

* Nov/Dec-2008 *

7. Derive the equation for mean square value of quantization noise. If a signal x (t) is uniformly distributed over the range of ± V volts, derive the equation for signal to quantization noise ratio. **10**

8. What are the drawbacks of delta modulation scheme? With a proper block schematic & waveform representation explain how Adaptive delta modulation removes these drawbacks. **10**

9. What are the drawbacks of closed loop bit synchronizer? Explain with neat sketch Early-Late synchronization method. **10**

* April/May-2009 *

10. The information in an analog signal voltage waveform is to be transmitted over a PCM system with an accuracy of ± 0.1 % of full scale. The signal has a band width of 200 Hz & an amplitude range of ± 10 V.

i) Determine the sampling interval if signal is sampled 40 % above Nyquist value.

ii) Determine no of bits in each PCM word.

iii) Find minimum bit rate & hence transmission band width. **10**

11. What is the need of vocoders? Explain with neat sketch LPC transmitter & receiver. Also discuss voice model used in it. **10**

12. Discuss the following.

i) Eye diagram.

ii) T_1 voice PCM channel bank. **10**

* Nov/Dec-2009 *

13. For a full scale sinusoidal modulating signal with peak value A, show that O/P. signal to quantization noise ratio in binary PCM system is given by S/N = 1.76 + 20 log M Db where M = N of quantization levels. A compact disc recording system samples each of the two stereo signals with a 16 bit A/D converter at 44.1 kb/sec.

i) Determine O/P S/N ratio for full scale sinusoid.

ii) The bit stream of digitized data is augmented by addition of error correcting bits, clock extraction bits etc. & these additional bits represent 100 % overhead. Determine the output bit rate of CD system.

iii) The CD ca record an hour's worth of music. Determine number of bits recorded o CD. **10**

14. List various encoding methods used in digital signal transmission with appropriate wave patterns for source data as "11010010". (Any five patterns). **10**

15. Explain & differentiate:

i) PCM.

ii) Delta.

iii) Differential PCM. **10**

* April/May-2010 *

16. i) Draw the generalized binary eye pattern & discuss the conclusions obtained from it.
ii) Explain with a neat sketch & diagram working of closed loop bit synchronizer. **10**

17. Five telemetry signals each of BW 1KHz are to be transmitted by binary PCM-TDM. The maximum tolerable error in the sampling amplitude is 0.5 % of peak signal amplitude. The signals are sampled at least 20 % above the Nyquist rate. Framing & synchronization require additional 0.5 % extra bits. Determine the minimum transmission data rate & minimum required bandwidth. **10**

18. Explain with block schematic linear predictive coder & decoder. Discuss the use of voice model used in it. State advantages & disadvantages of this method over other voice coding method. **10**

* Nov/Dec-2010 *

19. What do you mean by multiplexing? Explain quasi synchronous multiplexing in detail. **10**

20. Write short notes on:
i) Frame synchronization. ii) Bit synchronization. **10**

21. A telephone signal with cut off frequency of 4 KHz is digitized into 8 bit PCM sampled at Nyquist rate. Calculate baseband transmission bandwidth & quantization S/N ration. **10**

* April/May-2011 *

22. What is the need of synchronization? Explain with appropriate diagram the working principle of Early & Late synchronizer. **10**

23. Derive the equation of mean square value of quantization error in PCM. Also show that the (S/N) = 6 n Db, when the base band signal is uniformly distributed over the entire range. **10**

24. The output f digital source is 1011011001. Encode this output in
i) Unipolar RZ
ii) Polar NRZ
iii) Bipolar NRZ
iv) Split phase Manchester
v) Quaternary encoding format.

* Nov/Dec-2011 *

25. Consider audio signal comprised of sinusoidal term s(t) = 3 cos 500 πt.

i) Find signal to quantization noise ratio when this is quantized using 10 bit PCM.

ii) How many bits of quantization are needed to achieve signal to quantization noise ratio of at least 40 dB? **10**

26. Plot the line codes for sequence 1101001010. (any five) **10**

27. Explain delta modulation in detail. **10**

* April/May-2012 *

28. Derive signal to quantization noise ratio in PCM. How companding can improve SNR. **10**

29. i) Draw & explain Early-late synchronizer.

ii) Draw & explain eye diagram. **10**

30. Draw & explain Delta modulation. How slop overload & granular noise can be removed. **10**

* Nov/Dec-2012 *

31. Explain Delta modulation transmitter with Granular Noise & Slop overload errors. **10**

32. Encode '10111001' in any five types of line codes. **10**

33. For a full scale sinusoidal modulating signal with peak value A, show that O/P. signal to quantization noise ratio in binary PCM system is given by S/N = 1.76 + 20 logM Db where M = No of quantization levels. A compact disc recording system samples each of the two stereo signals with a 16 bit A/D converter at 44.1 kb/sec.

i) Determine O/P S/N ratio for full scale sinusoid.

ii) The bit stream of digitized data is augmented by addition of error correcting bits, clock extraction bits etc. & these additional bits represent 100 % overhead. Determine the output bit rate of CD system.

iii) The CD ca record an hour's worth of music. Determine number of bits recorded o CD. **10**

* April/May-2013 *

34. Write short notes on bit synchronizer & early late synchronizer. **10**

35. Write short notes on.

i) Digital Multiplexers.

ii) Companding. **10**

36. Encode '1111101' in any five types of line codes. **10**

UNIT-IV

* Nov/Dec-2007 *

1. Explain with suitable diagram, the transmitter & the receiver of QPSK. **10**

2. Explain in detail.

i) BFSK

ii) M-ary PSK Transmission & Reception. **10**

3. Classify digital modulation techniques. Explain M-ary FSK Transmitter & Receiver. **10**

* April/May-2008 *

4. Draw & explain BPSK transmitter & receiver. If b (t) is 001010011 with bit rate 'f_b' is equal to carrier frequency 'f_o' sketch the output waveform. **10**

5. Draw & explain BFSK transmitter & receiver. If b (t) is 001010011 to be transmitted sketch Waveform if $f_L = f_b$ & $f_H = 2f_b$. **10**

6. Draw & explain QPSK transmitter & receiver with neat waveform. **10**

* Nov/Dec-2008 *

7. With a suitable diagram, explain generation & reception of FSK signal in digital CW modulation system. Elaborate your answer with necessary waveforms & expressions, what is bandwidth requirement of FSK. **10**

8. i) Give in detail comparison between BPSK & DPSK.

ii) With proper signal space representation explain 16-array QAM. **10**

9. Derive the equation for error probability for BPSK with coherent detection. **10**

* April/May-2009 *

10. With proper equation explain the concept of Binary Phase Shift Keying transmission & receiption mechanism. Draw the frequency spectrum of the same. **10**

11. Explain QASK system with its transmitter, receiver & signal space representation. **10**

12. With neat derivation show that the error probability in BPSK detection is given as

$$P_e = \tfrac{1}{2} \operatorname{erfc} \sqrt{E/N_o}$$ **10**

* Nov/Dec-2009 *

13. Explain transmitter & receiver of BFSK & explain M-ary FSK. **10**

14. Differentiate PSK & DPSK. **10**

15. Explain minimum shift keying & GMSK. **10**

* April/May-2010 *

16. Explain quadrature phase shift keying technique of digital CW modulation. Elaborate your answer with suitable expressions, signal space representation & necessary waveforms. **10**

17. Show that error probability for binary ask coherent detection system is given by

$$P_e = \frac{1}{2}\,\text{erfc}\left[\sqrt{P_s T/4N_o}\right]$$ **10**

18. Explain with neat sketch & waveforms the DPSK modulator. How it is different from BPSK? **10**

* Nov/Dec-2010 *

19. Explain generation & reception of QPSK. **10**

20. With neat diagram derive the spectrum of BFSK signal. How BFSK is represented in signal space? **10**

21. Write short notes on:

i) ASK. ii) FSK. iii) PSK. **10**

* April/May-2011 *

22. With neat sketch explain the working principle of differential PSK modulation scheme. How this method is different from BPSK? **10**

23. With neat diagram & necessary equations explain the working of QPSK scheme. Draw the signal space diagram. **10**

24. Derive equation of error probability of BFSK. **10**

* Nov/Dec-2011 *

25. Explain Minimum shift keying & compare with GMSK. **10**

26. Explain BPSK & QPSK with their power spectral density. **10**

27. Differentiate coherent detection & non coherent detection. Explain in brief ASK. **10**

* April/May-2012 *

28. Explain in detail coherent detection in BPSK reception. Also draw the spectral density of BPSK signal. **10**

29. With neat diagram explain BFSK transmitter & receiver. For the bit steam 0010110 to be Transmitted using BFSK sketch neat waveform with $f_L = f_b$ & $f_H = 2f_b$. **10**

30. Draw & explain constellation diagram for BPSK, QPSK, 8QAM & 16QAM. **10**

* Nov/Dec-2012 *

31. Explain QPSK waveform for the pattern "10110110" **10**

32. Explain MSK & compare with QPSK. **10**

33. Explain M-ary BFSK. **10**

* April/May-2013 *

34. Explain Transmitter & Receiver of QAM. **10**

35. Why MSK is called shaped QPSK. Explain MSK with the sequence '11000111'. **10**

36. Explain BPSK Generation & Receiver. Explain disadvantages of BPSK. **10**

UNIT-V

* Nov/Dec-2007 *

1. Explain:
i) TDMA
ii) FDMA
iii) CDMA. **10**

2. Show that for a matched filter the maximum signal component occurs at t = T & has magnitude equal to energy of signal. **10**

3. Explain integrate & Dump filter. Derive the equation for signal to noise ratio of it. **10**

* April/May-2008 *

4. Draw & explain FHSS transmitter & receiver what is slow & fast hopping. **10**

5. What is multiple access. Explain TDMA, FDMA wih neat diagram. **10**

6. Draw & explain DS-SS transmitter & receiver. **10**

* Nov/Dec-2008 *

7. State & prove the properties of matched filter. **10**

8. i) Explain application of spread spectrum modulation.
ii) With a neat sketch explain a pseudo random sequence generator. **10**

9. With the help of suitable diagrams, expressions timing presentation, describe the method of generating & decoding a direct sequence spread spectrum signal using BPSK modulation. **10**

* April/May-2009 *

10. Explain what is matched filter. How it differs from optimum filter. Derive an expression for impulse response of matched filter. **10**

11. Define & describe spread spectrum modulation. Give classification based as modulation involved. What are peseudo-noise sequences? Explain the method to generate Peseudo-noise sequence. **10**

12. With neat diagram explain Direct sequence spread spectrum technique & discuss the following.
i) Processing Gain.
ii) Jamming Gain. **10**

* Nov/Dec-2009 *

13. Compare TDMA, FDMA & CDMA. **10**

14. How is spread spectrum signal different from normal signal? Enlist the application of spread spectrum modulation. Classify the modulation techniques. **10**

15. Derive expression for impulse response of matched filter. **10**

* April/May-2010 *

16. With the help of block diagram explain the principle of FH-SS M-ary frequency shift keying transmitter & receiver. **10**

17. Derive the equation for transfer function of optimum filter which ensures minimum probability of error. **10**

18. What is CDMA? How it is differs from other multiple access techniques? Discuss CDMA with use of DSSS technique. **10**

* Nov/Dec-2010 *

19. Explain with waveforms, integrate & dump circuit used for baseband signal detection. **10**

20. Derive the equation of error probability of optimum filter. **10**

21. Write short notes on:

a) PN sequence (PSEUDO-NOISE)

b) Direct sequence spread spectrum (DSSS). **10**

* April/May-2011 *

22. With the help of suitable expressions, timing & spectral diagrams, block schematic etc, describe the method of generating & decoding direct sequence spread spectrum signal using BPSK modulation. **10**

23. With the help of block schematic explain the method of CDMA encoding & decoding technique. Compare the same with FDMA & TDMA. **10**

24. Derive the equation for transfer function & impulse response of matched filter. Clearly indicate the assumptions you make. **10**

* Nov/Dec-2011 *

25. Derive an expression for transfer function of optimum filter. **10**

26. Explain DSSS with frequency hopped. **10**

27. Compare multiple access techniques. **10**

* April/May-2012 *

28. Explain in detail FHSS. What is slow hopping & fast hopping. **10**

29. Explain CDMA & make comparison with FDMA & TDMA. **10**

30. Explain optimum filter & matched filter. **10**

* Nov/Dec-2012 *

31. Explain TDMA & Compare with CDMA. **10**

32. Explain frequency hopping techniques with applications. **10**

33. Explain DSSS with coherent BPSK. **10**

* April/May-2013 *

34. Write short notes on:

i) Optimum filter

ii) Matched filter. **10**

35. Explain Pseudo-noise sequence. Why they are used in spread spectrum modulation. **10**

36. Explain Multiple access techniques. **10**