Code No: RR211901 **Set No.1**

II B.Tech. I Semester Supplementary Examinations, May -2005
SIGNALS & MODULATION THEORY
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define orthogonal functions. Give some examples of orthogonal functions. Verify that sinusoidal functions are orthogonal or not.
   (b) Derive the relation between Trigonometric and exponential Fourier series coefficients.
2. (a) Find the auto correlation of f(t) = Sin ω_ct.
   (b) Derive the relation between convolution and correlation functions of f_1(t) and f_2(t).
3. (a) Determine whether or not the system T[x(n)]=x(|n|) is causal. Justify answer.
   (b) Find the unit impule and the unit step response of the ideal High Pass Filter whose transfer function is H(w)=[1-G_{2w}(w)]e^{-jwto}.
4. (a) What is Frequency Translation? Why is this needed?
   (b) Explain the method of generating AM signal using a switching device.
5. (a) Derive the expressions for FM and PM signals.
   (b) Explain how NBFM is generated using Balanced modulator.
6. (a) State and prove sampling theorem in frequency domain.
   (b) Explain the effect of aliasing on sinusoidal signal.
7. (a) Determine the minimum bandwidth and baud for a BPSK modulator with a carrier frequency of 40 MHz and an input bit rate of 500 Kbps. Sketch the output waveforms.
   (b) Explain
      i. Quad bit
      ii. QAM
8. (a) Compare line-coding techniques in terms of minimum bandwidth, average DC voltage, clock recovery and error detection capabilities of line coding formats.
   (b) Encode the following BP RZ-AMI data stream with B6ZS and B2ZS + - 0000 + - + 0 - 00000 + - 00 +.

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Code No: RR211901 **Set No.2**

II B.Tech. I Semester Supplementary Examinations, May -2005
SIGNALS & MODULATION THEORY
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define even and odd functions. Give some examples. Prove that an even periodic function contain only cosine terms in its Fourier representation.
   (b) Find the Fourier transform of unit-step and signum functions and plot its spectrums.

2. (a) Determine and plot the auto-correlation function of A sin c (2ωt).
   (b) Find the auto-correlation function of a gate function given below.(figure1)

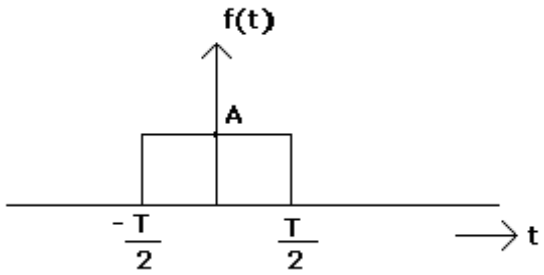

Figure 1:

3. (a) Determine the response of a Linear system driving with a impulse function?
   (b) A signal x(t) =1 for $0 \leq$ t <1 and zero otherwise is passed through a system, which has impulse response h(t) = x(t). Compute the output y(t).

4. (a) What is the highest modulation coefficient (index) and Percent Modulation possible with a conventional AM system?
   (b) Giving the advantage of vestigial side band explain the generation and demodulation of VSB.

5. (a) A carrier is frequency modulated by a sinusoidal modulating signal of freqeuncy 2KHz, resulting in a frequency deviation of 5KHz. What is the bandwidth occupied by the modulated waveform.
      i. If the amplitude of the modulating sinusoid is increased by a factor 2 and its frequency lowered by 500 Hz. What is the new bandwidth.
   (b) Explain the action of limiting circuit. Explain why a Ratio detector doesn't need a limiter for its demodulation.

6. (a) State and prove sampling theorem in frequency domain.

(b) Explain the effect of aliasing on sinusoidal signal.

7. (a) Determine the minimum bandwidth and baud for a BPSK modulator with a carrier frequency of 40 MHz and an input bit rate of 500 Kbps. Sketch the output waveforms.

   (b) Explain

      i. Quad bit

      ii. QAM

8. Draw the waveform for the binary data 01101001 when

   (a) on off signaling is used

   (b) NR signaling is used

   (c) RZ signaling is used

   (d) Split phase (Manchester coding is used) and give one application of each of the above signaling techniques.

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Code No: RR211901 **Set No.3**

II B.Tech. I Semester Supplementary Examinations, May -2005
SIGNALS & MODULATION THEORY
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Show that if two signals are orthogonal over an interval t_1, t_2, then the energy of the sum of the two signals is equal to the sum of the energies of the signals.
   (b) Find the F.T of (t-2) f(t) and (1-t)f(1-t).
2. (a) Show that the cross correlation of f(t) with δ(t-t_0) is equal to f(ι+t=0). Where δ(t-t_0) is delayed unit impulse function.
   (b) Determine and sketch the average auto-correlation function of given signal. (figure2)

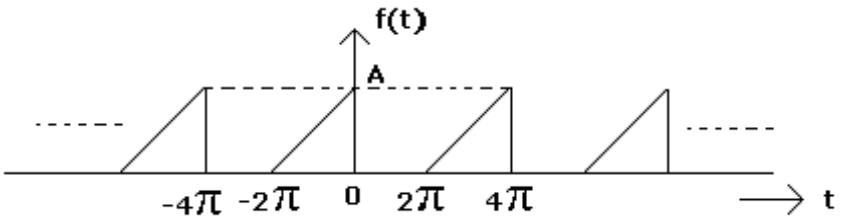

Figure 2:

3. (a) What are the requirements of a system to allow the distortion less transmission of a signal?
   (b) Show the response of ideal low pass filter when unit step is applied.
4. (a) Describe Upper & Lower side bands and the Upper & Lower side frequencies.
   (b) Explain AM DSBFC.
5. (a) With circuit diagrams, explain how, and for what reason, the ratio detector is derived from the phase discriminator, listing the properties advantages of each circuit.
   (b) The mutual conductance of a FET varies linearly with gate voltage between the limits 0 and 9 ms. The FET is used as a capacitive reactance modulator. With X_{cgd}=8R_{gs}, is placed across an oscillator circuit, which is tuned to 50MHz by a 50pf fixed capacitor.
      i. What will be the total frequency variation when the transconductance of the FET is varied from zero to maximum by the modulating voltage.
6. (a) Consider the analog signal.
   $e_m(t) = 2Cos(1000\pi t) + 3Sin(3000\pi t) + 5Cos(6000\pi t)$

i. Find the Nyquist rate for this signal.
ii. Determine the sampled signal when the above signal is sampled at a rate 2500 samples/sec.
iii. Determine the reconstructed analog signal from the samples if we use an ideal interpolations.

(b) Explain the need for compounding and how it is implemented.

7. (a) Compare ASK and FSK binary digital modulation schemes.
   (b) Write short notes on optimum receiver filter.

8. (a) Summarize the characteristics of Bi-polar, Miller and dicode encoding formats with a neat waveform for the clear data stream. 11010100011
   (b) Write short notes on "Line Coding".

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Code No: RR211901 **Set No.4**

II B.Tech. I Semester Supplementary Examinations, May -2005
SIGNALS & MODULATION THEORY
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Prove the symmetry properties of F.T.
   (b) Find the F.T. of periodic impulse train of unit strength with period T.
2. (a) Prove that the correlation and convolution functions are identical for even signals.
   (b) Show that the auto-correlation function at the origin is equal to the energy of the function.
3. (a) Determine the response of a Linear system driving with a impulse function?
   (b) A signal x(t) =1 for $0 \leq$ t <1 and zero otherwise is passed through a system, which has impulse response h(t) = x(t). Compute the output y(t).
4. (a) What is the highest modulation coefficient (index) and Percent Modulation possible with a conventional AM system?
   (b) Giving the advantage of vestigial side band explain the generation and demodulation of VSB.
5. (a) Determine the value of the capacity reactance obtainable from a reactance FET whose gm is 12ms. Assume that the gate to source resistance is $1/9^{th}$ of the reactance of the gate to drain capacitor and that the frequency is 5MHz.
   (b) Explain how the ratio detector demodulates on FM signal, proving that the output voltage is proportioned to the difference between the individual input voltages to the diodes.
6. (a) Derive the expression for transfer function of flat top sampled signal.
   (b) If m(t) is band limited that is m(w)=0, for|w| >w_mThen show that
   $\int_{-\infty}^{\infty} |m(t)|^2 dt = T_s \sum_{n=-\infty}^{\infty} [m(nT_s)]^2 \; where \; Ts = \frac{\pi}{w_m}$
7. (a) Describe with figures, non coherent detection of ASK signals.
   (b) Derive an expression for the probability of bit error for ASK.
8. Draw the waveform for the binary data 01101001 when
   (a) on off signaling is used
   (b) NR signaling is used
   (c) RZ signaling is used

(d) Split phase (Manchester coding is used) and give one application of each of the above signaling techniques.

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