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

II B.Tech I Semester Regular Examinations, November 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. [8+8]

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)

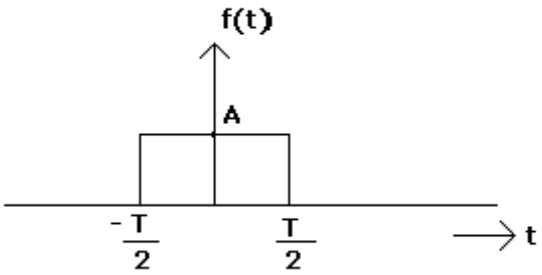

Figure 1:

[8+8]

3. (a) Find the relationship between the bandwidth and the rise time of a filter?
   (b) What is ideal filter? Find impulse response of a ideal Low Pass Filter? [8+8]

4. (a) Discuss the method of generating AM wave with square law modulator.
   (b) A DSB-SC signal (Cos ω_m t + Cos 2 ω_m t) Cos ω_c t is applied to a receiver consisting of a BPF, a mixer and a LPF cascaded in that sequence . The other input to the mixer is 2 Cos ω_it & BPF is centered about ω_i. Find the signals at the input and also at the output of the mixer & LPF if $\omega_i = \omega_c - 3\ \omega_m$.
   [8+8]

5. (a) Describe the Indirect method of generation of FM with neat block diagram.
   (b) A carrier is frequently modulated by a sinusoidal signal f(t)=$\frac{1}{2}$cos 2500t. Find the power carried by the carrier and the sidebands if K_f=30,000. [8+8]

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
   $\int_{-\infty}^{\infty} |m(t)|^2 dt = T_s \sum_{n=-\infty}^{\infty} [m(nT_s)]^2 \ where\ Ts = \frac{\pi}{w_m}$ [8+8]

7. Write short notes on:
   (a) M-ary signaling schemes
   (b) DPSK. [8+8]
8. Write short notes on
   (a) Bipolar coding
   (b) Manchester coding [8+8]

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

II B.Tech I Semester Regular Examinations, November 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) State and prove duality and frequency differentiation properties of F.T.
   (b) Determine the exponential Fourier series and hence the F.T. of the periodic gate function given below.(figure1)

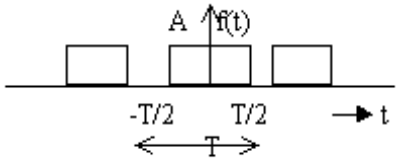

Figure 1:

[6+10]

2. (a) Find the auto-correlation function and also power spectral density of the signal, $f(t) = A\,Sin\ (\omega_o t + \phi_1) + B\,Sin\ (2\omega_o t + \phi_2)$, where ω_o = fundamental frequency component.
   (b) Mention the applications of correlation function. [8+8]

3. (a) Find the impulse response of the following system and its transfer function.(figure2)

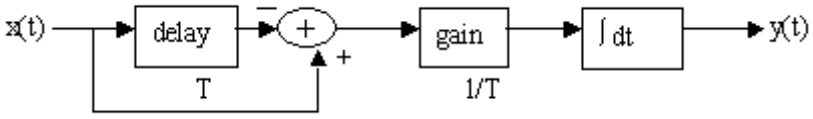

Figure 2:

   (b) Obtain the response of a Low Pass Filter to a rectangular pulse. [8+8]

4. (a) Describe the meaning of each term of the following expression.
   $V_{am}(t)$= 10 Sin (2π 500Kt)- 5 Cos (2π 515 Kt)+ 5 Cos (2π 485Kt)
   (b) Describe AM SSBSC.Compare SSB SC to conventional AM. [8+8]

5. (a) A single-tone modulating signal cos ($15\pi \times 10^3$t) frequency modulates a carrier of 10MHz and produce a frequency deviation of 75KHz. Find
      i. Modulation index and

ii. phase deviation produced in FM wave

iii. If another modulating signal produces a modulation index of 100 while maintaining the same deviation. [2+2+5+7]

Find the frequency and amplitude of the modulating signal assuming K_f=15 KHz/volt.

(b) Why FM is more immune to Noise compared to AM. Explain.

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

(b) Explain the effect of aliasing on sinusoidal signal. [10+6]

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+4+4]

8. What are the different waveform patterns of digital signals, explain them. [16]

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

II B.Tech I Semester Regular Examinations, November 2005
SIGNALS & MODULATION THEORY
(Electronics & Computer Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

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. [8+8]

2. Let $\phi_{12}(\iota)$ represents cross-correlation of $f_1(t)$ and $f_2(t)$. If $\phi_{12}^n(\tau)$ represents the n^{th} derivative of $\phi_{12}(\iota)$, then show that
   $$\phi_{12}^{(j+k)}(\tau) = (-1)^k \int_{-\infty}^{\infty} f_1^j(t) f_2^k(t-\tau).dt$$ [16]

3. (a) Find the relationship between the bandwidth and the rise time of a filter?
   (b) What is ideal filter? Find impulse response of a ideal Low Pass Filter? [8+8]

4. (a) Describe the meaning of the following expression.
   $V_{am}(t)=E_c \text{ Sin } (\omega_c t) - mE_c/2\{ \text{Cos } [2\pi(f_c+f_m)t]\} + mE_c/2 \{\text{Cos } [2\pi(f_c-f_m)t]\}$
   (b) Describe AM SSBFC . Compare SSBFC to conventional AM. [8+8]

5. (a) A carrier of frequency $10^6 Hz$ and amplitude 3V is frequency modulated by a sinusoidal modulating waveform of frequency 500Hz and peak amplitude IV. The frequency deviation is 1KHz. Write the expression for the level of FM wave modulating waveform is changed to 5 peak and the modulating frequency is changed to 2KHz. Write the expression for the new FM, wave.
   (b) With neat circuit diagram explain the operation of Foster seeley discriminator. [8+8]

6. (a) State and prove sampling theorem in frequency domain.
   (b) Explain the effect of aliasing on sinusoidal signal. [10+6]

7. (a) What is the difference between bit rate and baud rate? Derive the relation between the two for QPSK signal.
   (b) Draw QPSK transmitter circuit and explain its operation. What is the band width required for transmission. [8+8]

8. Write short notes on
   (a) Bipolar coding
   (b) Manchester coding [8+8]

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

II B.Tech I Semester Regular Examinations, November 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. [6+10]

2. (a) Find the cross-correlation of an arbitrary function and impulse function.
   (b) Define auto-correlation and cross-correlation prove any two properties of correlation function. [6+10]

3. (a) Consider a LTI system with impulse function f(t)= $e^{-4|t|}$. Find the Fourier Series representation of the output y(t) for the following input.
   x(t)= sin $(4\pi t)$ + cos $(6\pi t + \pi/4)$
   (b) For the system shown in find
   f(t) = e^{-at} for t $\geq$0; |a| $\geq$1
   = 0 other wise
   Y(w) = $1/(\alpha + jw)$ for -∞ <w< ∞
   = 0 other wise
   find the transfer function and impulse response of the filter (figure1)

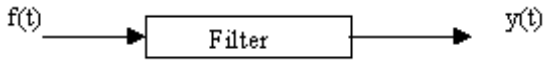

Figure 1:

[8+8]

4. (a) What is meant by Modulation? Why modulation is necessary?
   (b) A 108 KHz carrier wave is amplitude modulated by a band of frequencies from 300 Hz to 3400 Hz. What frequencies are contained in the upper and lower side bands of the AM wave and what is the bandwidth to transmit this wave? [8+8]

5. Consider the frequency demodulation scheme shown in the figure in which the incoming FM wave is S(t) = A_c cos ($w_c t + \beta \sin w_m t$). The delay line produces a phase shift of $\frac{\pi}{2}$ radians at the carrier frequency f_c.Analyze the operation of this demodulator when the modulation index β <1 and delay T produced by the delay line is sufficiently small to justify making the approximately. (figure2)
   Cos(w_mT)$\approx$T and sin (w_mT)$\approx w_m$T

[16]

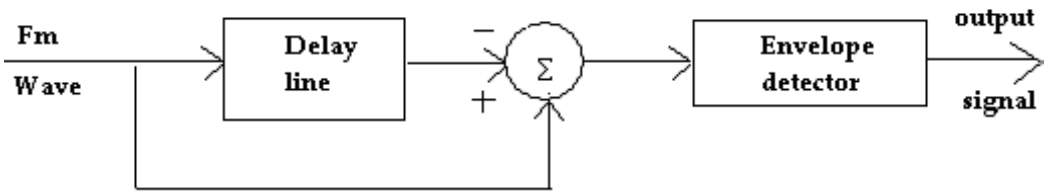

Figure 2:

6. (a) State and prove sampling theorem in frequency domain.
   (b) Explain the effect of aliasing on sinusoidal signal. [10+6]
7. (a) What is difference between standard FSK and MSK.
   (b) What is advantage of MSK.
   (c) Explain PSK with a neat diagram. [6+4+6]
8. What are the different waveform patterns of digital signals, explain them. [16]

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