Code No: NR211901 **NR**

II B.Tech I Semester Supplementary Examinations, May 2005
SIGNALS AND 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) Find the F.T. of $f(t) = \frac{1}{T}\left[1 - \frac{|t|}{T}\right],\ |t| < T$
$= 0$, otherwise.
   (b) Find the energy and BW of the signal f(t) = e^{-at} .u(t).

2. (a) Define auto-correlation and cross-correlation functions. Prove that $\phi_{12}(\iota) = \phi_{21}(\iota)$, where $\phi_{12}(\iota)$ is the correlation between $f_1(t)$ and $f_2(t)$ and $\phi_{21}(\iota)$ is the correlation between $f_2(t)$ and $f_1(t)$.
   (b) Find the auto-correlation of f(t)=Sin wt.

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) Show that a VSB wave plus carrier wave retains the base-band information in its envelope.
   (b) Explain frequency and phase error in synchronous detection of DSB-SC signals.

5. The figure below shows the frequency determining network of a voltage controlled oscillator. Frequency modulation is produced by applying the modulating wave $A_m\sin(w_m t)$ (plus a bias V_b) to a pair of varactor diodes connected across the parallel combination of a 200μH inductor and 100pf capacitor. The capacitance of each varactor diode is related to the voltage V applied across its electrodes by

   $C = 100V^{-1/2}$ pf

   The unmodulated frequency of oscillation is 1MHz. The VCO output is applied to a frequency multiplier to produce an FM wave with a carrier frequency of 64MHZ and modulation index of 5. (figure1)

   Determine:

   (a) The magnitude of the bias voltage V_b.
   (b) The amplitude A_m of the modulating wave, given that f_m = 10KHZ. μ

6. (a) Explain in detail the effect of analog to digital conversion. Compare analog and digital systems.
   (b) A sinusoidal signal is to be transmitted using pan so that the output signal to quantizing noise ratio is 49.8 dB. Find the minimum number of representation levels L and binary code word n to achieve this performance.

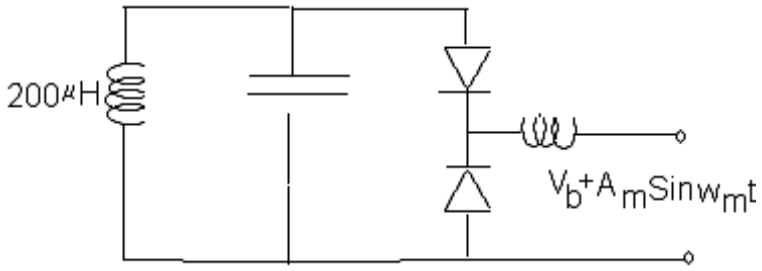

Figure 1:

7. (a) Derive and expression for the transfer function of the optimum filter when the channel noise is white ($G_n(f) = \eta/2$) and Gaussian.
   (b) Compare M-ary signaling schemes with binary schemes.
8. What are the different waveform patterns of digital signals, explain them.

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