Code No: R22041 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations Dec – 2012
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain the generation of AM wave using square law modulator.
   b) A tone modulated AM-signal with a modulation index of "m" and base band signal frequency of ω_m is detected using envelope detector, whose time constant is RC, for effective demodulation, show that $(1/RC) \geq [m\ \omega_m/(\sqrt{1-m^2})]$.

2. a) Explain the concept of frequency translation using the spectrum of DSB-SC wave.
   b) In an AM-SC system, modulating signal is a single tone sinusoidal signal $4\cos 2\pi 10^3 t$, which modulates carrier signal $6\cos 2\pi 10^6 t$. Write the equation of the modulated wave. Plot the two sided spectrum of the modulated wave. Calculate the amount of power transmitted.

3. a) Explain the frequency domain description of the SSB-SC wave.
   b) Explain with block diagram the frequency discrimination method of generating SSB modulated waves.

4. a) Derive the expression for angle modulation from fundamentals and hence differentiate PM and FM.
   b) An angle modulated signal is described by $X(t) = 10[\cos 2\pi 10^6 t + \sin \pi 10^3 t]$. Considering the above signal,
   i) As PM signal with phase sensitivity factor of 10 rad/volt, find the base band signal.
   ii) As FM signal with phase sensitivity factor of 10πHz/volt, find the base band signal.

5. a) Derive the expression for figure of merit for SSB receiver.
   b) A DSB signal with additive white noise is demodulated by a synchronous detector using a local carrier of $2\cos(\omega_c t + \Phi)$. Show that the figure of merit of the receiver is $\gamma \cos^2 \Phi$.

6. a) Draw the block diagram of AM transmitter using low level modulation. Explain the significance of each block.
   b) What are the carrier frequency requirements in a radio transmitter? Explain

7. a) With neat diagram, explain the general process of frequency changing in a super heterodyne receiver and the basic super heterodyne principle.
   b) In a broadcast super heterodyne receiver having no RF amplifier the loaded Q of the antenna coupling circuit (at the input to the mixer) is 100. If the intermediate frequency is 455 kHz, calculate
   i) The image frequency and its rejection ratio at 1000 kHz.
   ii) The image frequency and its rejection ratio at 25 MHz.

8. Write short notes on
   i) TDM Vs FDM ii) Generation of PPM
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Code No: R22041 **R10** SET - 2

II B. Tech II Semester Supplementary Examinations Dec – 2012
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) What is the need for modulation? Explain different constraints.
   b) An AM wave is given by S(t) = 25(1+ 0.7cos5000t – 0.3cos10000t) sin $5x10^6$t.
      i) What are the amplitudes and frequencies of the carrier and the side bands?
      ii) Draw the one sided amplitude spectrum.
      iii) Determine the bandwidth.

2. a) Explain the generation of the DSB-SC wave by the balanced modulator using diodes.
   b) For the balanced ring modulator fc = 400kHz, fm = (0kHz to 4kHz) determine the
      i) Frequency spectrum.
      ii) Output frequency for a single frequency input fm = 2.8kHz.

3. a) Draw the block diagram of a phase cancellation SSB generator and explain how the carrier and unwanted sidebands are separated.
   b) Prove that the signal $S(t)=\sum_{i=1}^{N}\left[\cos(\omega_c t)\cos(\omega_i t+\Phi_i)-\sin(\omega_c t)\sin(\omega_i t+\Phi_i)\right]$ is an SSB signal ($f_c >> f_N$) where $\omega_c = 2\pi f_c$; carrier angular frequency and $\omega_i = 2\pi f_i$ is the modulating angular frequency.
      i) Identify the sideband.
      ii) Obtain an expression for missing sideband.
      iii) Obtain the total expression of the total DSB-SC signal.

4. a) Define modulation index in FM. Discuss the separation of NBFM and WBFM for various modulation indices.
   b) Discuss the merits and demerits of AM and FM modulation techniques.

5. a) Calculate signal to noise ratio for amplitude modulation .
   b) Show that for a DSB-SC system, the power densities of various components of band pass noise are related as
      $Snc(\omega) = Sns(\omega) = 2Sn(\omega)=\eta$ for $-\omega_m < \omega < \omega_m$

6. Explain about AM transmitter with neat diagram , why feedback is used in the AM transmitter? Explain its uses.

7. a) List out the advantages and disadvantages of TRF receivers.
   b) What is an image frequency? How is image frequency rejection achieved?

8. a) Explain, how a PPM signal can be generated from PWM signal?
   b) Explain with the block diagram, working of PWM.
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Code No: R22041 **R10** SET - 3

II B. Tech II Semester Supplementary Examinations Dec – 2012
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) With necessary expressions, waveforms and spectrums explain AM for an Arbitrary baseband signal m(t).
   b) The antenna current of an AM transmitter is 8Amps when only the carrier is sent, but it increases to 8.93 Amps, when the carrier is modulated by a single sine wave. Find the percentage modulation. Determine the antenna current when the percentage modulation changes to 0.8.

2. a) With the neat diagram, explain the DSB-SC generation by the balanced modulator using FET amplifiers.
   b) Explain the coherent detector of DSB-SC modulated wave.

3. a) Explain with the block diagram the phase discrimination method of generating SSB modulated waves.
   b) Explain the coherent detection of SSB signals.

4. a) Give the phasor comparison of narrowband FM and AM waves for sinusoidal modulation.
   b) Compute the bandwidth requirement for the transmission of FM signal having a frequency deviation of 75 kHz and an audio bandwidth of 10kHz.What will be the change in the bandwidth, if modulating frequency is doubled? Determine the bandwidth when modulating signal amplitude is also doubled.

5. a) Derive the expression for SNR of FM system.
   b) How pre-emphasis and de-emphasis are used to improve the threshold? Discuss.

6. a) Explain the working of the typical directly modulated FM transmitter with the help of neat diagram.
   b) Explain the concept of frequency stability in the FM transmitter.

7. a) What is tracking? How is tracking employed in super heterodyne receiver? Explain different methods.
   b) Find the value of the padder capacitor and oscillator inductor to give padder tracking for the receiver having tuning range of signals from 400kHz to 1650kHz and uses an IF of 455kHz. Assume that the value of Csmax is equal to 1650kHz and uses an IF of 455 kHz. Assume that the value of Csmax is equal to 300 pF. Also find the error in oscillator tracking frequency for a signal frequency of 1MHz.

8. a) Explain single and double polarity in PAM.
   b) Distinguish between TDM and FDM.
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Code No: R22041 **R10** SET - 4

II B. Tech II Semester Supplementary Examinations Dec – 2012
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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1. a) Explain with block diagram the basic communication system.
   b) Derive the expression for AM wave for single tone modulation and draw its frequency spectrum.

2. a) Consider the single –tone modulation and explain DSB-SC generation.
   b) Considering the wave obtained by adding a non-coherent carrier $A\cos(2\pi fct+\Phi)$ to DSB-SC wave $m(t)\cos(2\pi fct)$. The X(t) is the message wave form. This wave form is applied to an ideal envelope detector. Find the resulting detector output. Evaluate the output for
   i) $\Phi = 0$ and
   ii) $\Phi \neq 0$ and $|x(t)| << Ac/2$.

3. a) Show that VSB wave pulse carrier contains the baseband information in its envelope.
   b) A received single-tone sinusoidally modulated SSB-SC signal $\cos(\omega_c+\omega_m)t$ has a normalized power of 0.5 volt^2. The signal is to be detected by carrier reinsertion technique. Find the amplitude of the carrier to be reinserted so that the power in the recovered signal at the demodulator output is 90% of the normalized power. The DC component can be neglected and $\omega_c = 2\pi f_c$ and $\omega_m = 2\pi f_m$.

4. a) Derive the expression for the FM signal under tone modulation and derive the expression for its bandwidth.
   b) Explain the detection of FM-waves using PLL.

5. a) Prove that the figure of merit of AM system for single tone modulation with 100% modulation is 1/3.
   b) Explain the noise performance of SSB-SC receiver and prove its S/N ratio is unity.

6. a) With the neat block diagram explain phase modulated FM transmitter.
   b) What is an AFC? Discuss with the help of block diagram.

7. a) Explain about image frequency and image frequency rejection of radio receiver.
   b) What is the role of AGC in amplitude limiter circuits? Explain the principle of working of AGC in detail.

8. a) Draw the circuit of PPM demodulator and explain the operation.
   b) Write a short note on "Time Division Multiplexing".
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