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

II B. Tech II Semester Regular Examinations, August – 2014
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 modulation? Why is modulation used in communication system?
   b) What do you understand of modulation index? What is its significance? (8M+7M)

2. a) Distinguish between DSB-AM, DSB-SC, and SSB-SC system of modulation, sketch their waveform.
   b) The modulating signal $x(t)=2\cos(2000\pi t) + \sin(4000\pi t)$ is applied to a DSB modulator operating with a carrier frequency of 100 kHz. Sketch the power spectral density of the modulator output. (8M+7M)

3. a) Discuss a suitable method of generating an SSB signal. Describe a method of detecting such signal.
   b) A speech signal, as in a telephone system, occupies a frequency range 300Hz - 3400Hz (considered as baseband up to 3400Hz). In a carrier system it is transmitted in the form of SSB signal. Calculate the bandwidth saving as compared to AM signal transmission and also estimate the amount of power saving. (7M+8M)

4. a) Derive an expression for an FM signal with carrier frequency f_c and a modulating signal $A_1\cos\omega_1 t + A_2\cos\omega_2 t$. Obtain an expression for its spectrum.
   b) Why an FM system is preferred over an AM system? (8M+7M)

5. a) Calculate the figure of merit for a DSB-SC system.
   b) Prove that narrowband FM offers no improvement in SNR over AM. (8M+7M)

6. a) What is the significance of frequency stability of a transmitter? Explain the methods to achieve frequency stability?
   b) Draw the block diagram of a typical AM transmitter. Discuss the function of each block in brief. (8M+7M)

7. a) Explain the operation of Ratio detector with the help of neat diagram.
   b) In a broadcast super heterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit is 100. If the IF frequency is 455 kHz, determine the image frequency and its rejection for tuning at 25MHz. (8M+7M)

8. a) What do you mean by multiplexing? Explain TDM and FDM.
   b) State and explain sampling theorem in time domain.
   c) Explain difference between PPM and PWM. (6M+6M+3M)
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Code No: R22041 **R10** SET - 2

II B. Tech II Semester Regular Examinations, August – 2014
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) What is meant by the term amplitude modulation?
   b) Define the term modulation index for AM and explain its importance.
   c) Derive an expression for single tone amplitude modulated wave. (3M+5M+7M)

2. a) With a neat block diagram explain the demodulation process of DSB-SC signal.
   b) For a modulating signal $\cos 500\pi t$, determine the frequency components of DSB and DSB-SC signals when the carrier is $100\cos 5000\pi t$. Determine the power in the sidebands and carrier in each case. (7M+8M)

3. a) Describe Weaver's method of generation of SSB signals with the help of block diagram and suitable spectral diagrams.
   b) Compare the DSB and SSB systems.
   c) Determine the percentage of power saving when the carrier wave and one of the sidebands are suppressed in an AM wave modulated to a depth of 75 percentage. (8M+3M+4M)

4. a) Define and explain the following terms for FM wave
      i) carrier swing ii) frequency deviation and iii) percentage of modulation.
   b) Explain the salient features of wideband FM system.
   c) A carrier signal $10\cos(8000000\pi t)$ is modulated by a modulating signal $5\cos(30000\pi t)$.
      i) Find the bandwidth for frequency modulation assuming $k_f = 15$ kHz per volt
      ii) Assuming the same bandwidth, find k_p for phase modulation. (6M+3M+6M)

5. a) Compare the FM system with AM system from the point of view of noise performance.
   b) Explain, how noise can be calculated in a communication system.
   c) An AM receiver operates with a tone modulation, and the modulation index $m_a = 0.4$. The message signal is $20\cos(1000\pi t)$. Calculate the output SNR relative to the baseband performance. (5M+4M+6M)

6. a) With block diagram explain the working of phase modulated FM transmitter.
   b) What are the different types of AM transmitters?
   c) What is the significance of frequency stability of a transmitter and how the frequency stability can be achieved (8M+3M+4M)

7. a) What do you understand from tracking and alignment of the circuit?
   b) Explain the principle of automatic gain control.
   c) Of all the frequencies that have to be rejected by a super heterodyne receiver, why is the image frequency so important? If the image frequency rejection is insufficient, what are the steps that could be taken to improve it? (5M+4M+6M)

8. a) Enumerate the types of pulse modulation. Describe PDM system in detail. 8M
   b) Prove that if a signal whose highest frequency in W Hz has been sampled at a rate of 2W samples per second, the sampled signal may be reconstructed by passing the impulse train through an ideal low pass filter whose cutoff frequency is W Hz. (8M+7M)

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Code No: R22041 **R10** SET - 3

II B. Tech II Semester Regular Examinations, August – 2014
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) Derive the power relations for single-tone amplitude modulated wave.
   b) Explain the square-law diode modulation method for AM generation. (7M+8M)

2. a) Explain the working of suppressed carrier balanced modulator. State its advantages and applications.
   b) Why a DSB-SC modulation scheme is not much used inspite of the fact that it saves transmitter power as compared to AM?
   c) A signal $x(t) = 2\cos(1000\pi t) + \cos(2000\pi t)$ is multiplied by a carrier $10\cos(10^5\pi t)$. Give the expression for the upper sideband terms of product signal. (8M+4M+3M)

3. a) Explain what is meant by vestigial sideband transmission. What are its special characteristics? And how can these be achieved in practice. Discuss the specific examples where VSB is used.
   b) Show that if the output of a phase-shift modulator is an SSB signal, the difference of the signals at the summing junction produces the upper-sideband SSB signal. (8M+7M)

4. a) Derive an expression for an FM signal with carrier frequency f_c and a modulating signal $A_1\cos(\omega_1 t) + A_2\cos(\omega_2 t)$. Obtain an expression for the spectrum.
   b) Explain the difference between narrowband FM and wideband FM.
   c) What are the merits and limitations of FM. (7M+4M+4M)

5. a) Derive an expression of output SNR in an FM system.
   b) Prove that narrowband FM offers no improvements in SNR over AM. (8M+7M)

6. a) Draw the block diagram of a typical AM transmitter. Explain the function of each block in brief.
   b) What are the effects of frequency multiplication on the carrier frequency and the frequency deviation of an FM signal?
   c) What is the significance of Harmonic generator in transmitters? (8M+4M+3M)

7. a) Explain the functions of various sections of a superheterodyne receiver.
   b) Distinguish between simple AGC and delayed AGC.
   c) What is the use of a limiting amplifier in broadcasting chain? Discuss its desirable Characteristics. (7M+4M+4M)

8. a) Describe the spectral representation of PDM and PPM waves.
   b) Explain the generation of PWM signal.
   c) Compare TDM with FDM. (5M+5M+5M)
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Code No: R22041 **R10** SET - 4

II B. Tech II Semester Regular Examinations, August – 2014
ANALOG COMMUNICATIONS
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
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1. a) Draw the diode detector circuit and explain its action. (7M+8M)
   b) Show, giving a mathematical proof, how a square-law device can be used to generate an AM signal. Give complete diagram of the signal inputting and outputting arrangements.

2. a) Draw the circuit of a demodulator for DSB-SC signal and explain.
   b) Give mathematical expression for DSB-SC signal in time domain. Explain each term.
   c) Give comparison between DSB and SSB systems. (7M+4M+4M)

3. a) Discuss with a block diagram of a communication system using vestigial side band transmission.
   b) Compare VSB and SSB systems.
   c) For modulating signal $10\cos(600\pi t)$, determine the frequency components of DSB-Sc and SSB-SC signals when the carrier is $100\cos(10^4\pi t)$. Determine the power in the side bands and carrier in each case. (7M+3M+5M)

4. a) What are the various methods of frequency modulation commonly used in commercial applications. With a neat sketch explain the working of FET reactance modulator.
   b) Why is an FM system preferred over AM system?
   c) Consider an angle modulated signal $x_c(t) = 10\cos(\omega_c t + 3\cos\omega_m t)$, $f_m = 1$KHz. Assume the modulation to be FM. Determine the modulation index and find the transmission bandwidth when i) ω_m is increased by a factor of 4, and ii) ω_m is decreased by a factor of 4. (8M+3M+4M)

5. a) Calculate the figure of merit for a SSB-SC system.
   b) What is the significance of Pre emphasis and De emphasis in communication system? Explain in detail. (7M+8M)

6. a) What is transmitter? Give its applications.
   b) Explain the functions of peak limiters and peak clippers.
   c) With block diagram explain the working of phase modulated FM transmitter. (4M+4M+7M)

7. a) Why is the local oscillator frequency always made higher than the incoming signal frequency? 2M
   b) What do you understand by the following: i) selectivity ii) sensitivity iii) fidelity iv) delayed AGC. 8M
   c) Explain the operation of ratio detector. (2M+8M+5M)

8. a) Explain with diagrams, how PPM signals are generated and the modulated signal is recovered from a PPM waveform. Show the spectrum of a PPM waveform.
   b) Compare TDM with FDM.
   c) What is pulse modulation? Explain its advantages over CW modulation. (8M+3M+4M)
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