

**II B.Tech II Semester Supplementary Examinations, Nov/Dec 2005**  
**ANALOG COMMUNICATIONS**  
**(Electronics & Telematics)**

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

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Describe an operator's telephone circuit. How does it differ from a subscriber's telephone circuit.  
(b) Explain the phenomenon of acoustic shock. [10+6]
2. (a) Explain with block diagram, the frequency discrimination method for generating SSB modulated waves. [8+8]  
(b) Compare various AM techniques.
3. (a) The sinusoidal modulating wave  $m(t) = A_m \cos(2\pi f_m t)$  is applied to a phase modulation with phase sensitivity  $K_p$ . The unmodulated carrier wave has frequency  $f_c$  and amplitude  $A_c$ . Determine the spectrum of the resulting phase modulated wave, assuming that the maximum phase deviation  $\beta_p = K_p A_m$  does not exceed 0.5 radians.  
(b) A carrier wave of frequency 100 MHz is frequency modulated by sine wave of amplitude 20 volts and frequency 100 KHz. The frequency sensitivity of the modulation is 25 KHz per volt. Determine the approximate bandwidth of FM wave using Carsons rule. [8+8]
4. (a) Compare various FM demodulation techniques.  
(b) Explain the Foster-Seely discriminator. [8+8]
5. (a) An AM transmitter of 1KW power is fully modulated. Calculate the power transmitted if it is transmitted as SSB.  
(b) Calculate the filter requirement to convert DSB signal to SSB Signal, given that the two side bands are separated by 200HZ. The suppressed carrier is 29 MHz.  
(c) Give and explain 3 areas of applications where standard FM transmission is needed? [4+6+6]
6. (a) Write short notes on:
  - i. Frequency synthesizers.
  - ii. Spurious responses in radio receivers.(b) Bring out the factors influencing the choice of IF and indicate the values of IF employed in each of the following cases
  - i. AM Broadcast receivers.
  - ii. FM Broadcast receiver.

- iii. TV receivers in the VHF and UHF bands. [8+8]
7. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks. [6+5+5]
- (b) Discuss briefly similarities and differences between FM and AM receivers.
- (c) Write in detail about the limiter used in FM receiver.
8. Show that for tone modulation for a fixed peak power transmitted the output SNR of AM is 5db below that DSB-SC. [16]

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1. (a) What are the advantages and disadvantages of connecting automatic selection by grading instead of direct cabling from bank out lets to subsequent selectors.  
 (b) Give a diagram of 6 group grading with 31 trunks, the availability being 10. [10+6]
2. (a) Explain the ring modulator for generation of DSB-SC.  
 (b) Explain the Costas loop with the block diagram for demodulating DSB-SC waves. [8+8]
3. (a) Draw the complete block diagram of the Armstrong frequency modulation system and explain the function of the mixer and multipliers. In what circumstances can we dispense with the mixer?  
 (b) The equation of an angle-modulated voltage  $v(t) = 10 \sin(10^8 t + 3 \sin 10^4 t)$ . what form of angle modulation is this? Calculate the carrier and modulating frequencies, the modulation index and deviation and power dissipated in a 100-ohm resistor. [8+8]
4. (a) Distinguish between negative peak clipping and diagonal peak clipping in an envelope detector. The output of a diode envelope detector is fed through a DC blocking capacitor to an amplifying stage, which has an input resistance of 10 kilo-ohms. If the diode load resistor is 5k-ohm, determine the maximum depth of sinusoidal modulation the detector can handle with out negative peak clipping.  
 (b) Consider a composite wave obtained by adding a non coherent carrier  $A_c \cos(2\pi f_c t + \phi)$  to DSB-SC wave  $X(t) \cos(2\pi f_c t)$  where  $X(t)$  is the message waveform. This composite waveform is applied to ideal envelope detector. Find the resulting detector output. Evaluate this for .  
 i.  $\phi = 0$  and  
 ii.  $\phi \neq 0$  and  $|X(t)| \ll A_c$  [8+8]
5. (a) Explain how frequency stability is achieved in modern transmitter.  
 (b) Describe with aid of suitable diagram, the principal method of SSB power generation.  
 (c) Describe the advantages of a SSB system for high frequency point to point communication and explain why it is unsuitable for broadcasting. [4+6+6]

6. (a) Explain the principle of a simple Automatic Gain Control (AGC) of super heterodyne AM receiver.
- (b) What is the necessity for tracking in radio receivers? Explain briefly the tracking techniques used in radio receivers.
- (c) Write about separately excited mixer. [4+6+6]
7. (a) Draw a block diagram of communication receiver and describe the working of simple squelch system. [10+6]
- (b) Explain the principle of diversity reception techniques.
8. In a transmission system a noise process  $N(t)$  having power density  $\delta_n(\omega) = p^2/(p^2 + \omega^2)$  where  $P > 0$  is a constant is mixed with a signal  $A \cos(\omega_o t)$ . Determine
- (a) average signal to noise ratio
- (b) the value of  $P$  such that SNR is maximum. What is the effect of choosing this value of  $P$ . [16]

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1. (a) Compare the advantages and disadvantages of telephony over telegraphy.  
(b) Draw the circuit diagram of a duplex telegraph system and describe its operation. What is the function of line balance in such a circuit and indicate its form. [6+10]
2. (a) Explain the balanced modulator using FET amplifiers.  
(b) Compare various methods of SSB generation. [16]
3. (a) Distinguish between phase and frequency modulation. Show that FM can be derived using PM and vice versa with the help of differentiator or integrator networks.  
(b) Compute the bandwidth requirement for the transmission of FM signal having a frequency deviation 75 KHz and an audio bandwidth of 10KHz.  
(c) In a FM system the frequency deviation constant is 1KHz/v. A sinusoidal modulating signal of amplitude 15 V and frequency 3 MHz is applied. Calculate
  - i. Peak frequency deviation
  - ii. Modulating index[6+4+6]
4. (a) Distinguish between envelop detection and synchronous detection methods.  
(b) Explain the operation of limiter circuit in fm demodulation. [8+8]
5. (a) How will you avoid side bands of one station overlapping with other radio station?  
(b) Write short notes on the following:-
  - i. Peak limiters
  - ii. Peak clippers
  - iii. Volume compressors in radio transmitters. [4+12]
6. (a) Draw the block diagram of AM radio receiver and explain the function of each block.  
(b) Explain what is meant by image frequency. What are the considerations in the choice of IF in a Superheterodyne receiver? [8+8]
7. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks.

- (b) Discuss briefly similarities and differences between FM and AM receivers.
- (c) Write in detail about the limiter used in FM receiver. [6+5+5]
- 8. (a) Compare the noise performance of AM and its derived systems. [8+8]
- (b) Derive the SNR of AM with carrier when the amount of noise is very small

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1. (a) Explain about telex in detail.  
(b) A teleprinter has each character represented by one start element, seven characters elements, one parity element and one stop element, all of equal length. If teleprinter transmits one character in 100 m sec, what is the speed of transmission in bauds? How many printing and functional combinations are possible in this teleprinter transmission. [8+8]
2. (a) Explain the balanced modulator using FET amplifiers.  
(b) Compare various methods of SSB generation. [16]
3. (a) Explain clearly the difference between Amplitude, Frequency, and Phase modulations, beginning with the definition of each type and the meaning of the modulation index in each case.  
(b) Explain with the block diagram the Armstrong method of FM generation. [8+8]
4. (a) Explain the operation of a square law detector and compare it with envelope detector.  
(b) The signal  $v(t) = (1 + 0.1 \cos \omega_1 t + 0.1 \cos 2\omega_1 t) \cos \omega_c t$  is detected by a square law detection  $V_o = 2V^2$ . Put the amplitude -frequency characteristic of  $V_o(t)$ . [8+8]
5. (a) Draw the block diagram of Armstrong FM transmitter and explain the operation.  
(b) Explain the frequency modulated transmitter using reactance tube modulator. [8+8]
6. (a) Briefly explain the function of each of the block in the superheterodyne receiver.  
(b) Calculate the image rejection of a receiver having an RF amplifier and an IF of 450 Hz, if the  $Q_s$  of the relevant coils are 65 at an incoming frequency of
  - i. 1200 Hz
  - ii. 20 MHz.[8+8]
7. (a) Differentiate between simple, delayed and amplified AGC and explain their action with the help of simple circuits blocks. [6+5+5]  
(b) Discuss briefly similarities and differences between FM and AM receivers.

- (c) Write in detail about the limiter used in FM receiver.
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