

II B.Tech. II Semester Regular Examinations, April/May -2005
ANALOG COMMUNICATIONS
(Electronics & Telematics)

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

Answer any FIVE Questions
All Questions carry equal marks

1. (a) State the advantages of cross bar exchange. Explain in detail how a call is established between two subscribers in it.
(b) Draw and explain the trunking diagram of 1000 line exchange. What are the reasons for each subscriber being provided with one uniselector.
2. (a) Explain filter method of suppressing unwanted sideband.
(b) A SSB-SC transmitter operating at a 16MHz has frequency stability of 1 part per million. If its transmission is reproduced by a receiver whose stability is 8 part per million, what is the maximum frequency error at the output of the receiver could have in reproducing the transmission.
3. (a) An angle modulated wave is given by the equation $w(t) = 10 \cos(2\pi 10^6 t + 10 \cos 2000\pi t)$. Find
(b) Write the non-linear effects in FM systems.
(c) Obtain the relation between FM and PM.
 - i. the power of modulated signal
 - ii. the maximum frequency deviation
 - iii. the bandwidth of modulated signal.
4. (a) An FM signal $X_c(t) = A_0 \cos(\omega_0 t + \beta \sin \omega_m t)$ is applied as input to an RC high pass network. Assume that $\frac{1}{\omega RC} \gg 1$ in the frequency band occupied by $X_c(t)$. Show that the output voltage of RC network is an AM signal. Find the modulation index of AM signal.
(b) What is zero crossing detectors? Explain how it works and can be used as an FM demodulator?
5. (a) Explain the operation of radio transmitter using lower level modulation system
(b) What is master oscillator? What are the precautions to be taken in designing of master oscillator to reduce frequency drift.
6. (a) Explain the necessity for AGC in a radio communication
(b) Discuss the consideration that governs the choice of IF in a receiver.
(c) Explain the operation of superheterodyne receiver.
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
8. In a transmission system a noise process $N(t)$ having power density $\delta_n(w) = p^2/(p^2 + w^2)$ where $P > 0$ is a constant is mixed with a signal $A \cos(w_o t)$. 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 .

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1. (a) Give a neat sketch of a telephone relay and explain its working.
(b) A telephone relay having a resistance of 1500 ohms and an inductance of 3 Henries has an operating current of 20mA and release current of 8 mA. Calculate time lag in operating and in releasing when the relay is working across a 50v supply. Assume the relay short circuited under release conditions.
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
3. (a) Explain the principle of pre-emphasis and de-emphasis in FM with circuits
(b) A carrier frequency modulator by sinusoidal modulating signal of frequency 2KHz resulting in a frequency deviation of 5KHz. What is the bandwidth occupied by the modulated waveform?. The amplitude of the modulating sinusoidal is increased by factor of 3 and its frequency lowered to 1KHz. What is the new bandwidth?
4. (a) Explain with a circuit diagram the square-law detector.
(b) Explain the demodulation of FM signals.
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?
6. (a) Draw a block diagram of a typical AM receiver and describe briefly function of each block.
(b) Explain the necessity for:
 - i. Tone and volume control
 - ii. Alignment and tracking in radio receiver What is meant by spurious response of a receiver?
7. (a) Draw a neat diagram of a double conversion receiver and explain
(b) Define sensitivity, selectivity and fidelity.

- (c) Calculate the image frequency rejection of double conversion receiver which has a first IF of 2 MHz and second IF of 200 kHz, on RF amplifier whose tuned circuits has a Q of 75 (Same as that of mixer) and which is tuned to a 30MHz signal. Give the answer in decibels.
8. The average noise power per unit band width measured at the input of an AM receiver using envelope detector is 2 mW per Hz .The modulating wave is sinusoidal with a carrier power of 50 kW and a side band power of 5 KW per sideband. The message BW is 4 KHz. Determine o/p SNR

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1. State and explain clearly the differences between the following methods of telegraph working.
 - (a) Simplex
 - (b) Duplex
 - (c) Multiplex
 - (d) Diplex
2.
 - (a) What are advantages and disadvantages of FM over AM.
 - (b) The single-tone modulating wave $m(t) = A_m \cos 2\pi f_m t$ is used to generate the following Vestigial Side Band modulated wave $s(t) = a A_m A_c \cos[2\pi(f_c + f_m)t] + A_m A_c (1-a) \cos[2\pi(f_c - f_m)t]$ where a is a constant. Find the in-phase and quadrature components of the VSB modulated wave. For what value of constant 'a', $s(t)$ reduces to a DSB-SC modulated wave.
3.
 - (a) Explain the indirect method of FM generation.
 - (b) A 500Hz modulating voltage fed into a PM generator produces a frequency deviation of 2.25KHz. What is the modulation index if the amplitude of the modulating voltage is kept constant but its frequency is raised to 6KHz? What is the new deviation?
4.
 - (a) Explain with a circuit diagram the square-law detector.
 - (b) Explain the demodulation of FM signals.
5.
 - (a) Draw the block diagram of Armstrong FM transmitter and explain the operation.
 - (b) Explain the frequency modulated transmitter using reactance tube modulator.
6.
 - (a) Explain in detail the alignment and tracking of a radio receiver.
 - (b) Draw a practical diode detector and explain.
 - (c) Explain why local oscillator frequency should be higher than signal frequency
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

8. Obtain the expression for SNR and Figure of merit of coherent reception of SSB modulated wave.

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1. State and explain clearly the differences between the following methods of telegraph working.
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2.
 - (a) Explain filter method of suppressing unwanted sideband.
 - (b) A SSB-SC transmitter operating at a 16MHz has frequency stability of 1 part per million. If its transmission is reproduced by a receiver whose stability is 8 part per million, what is the maximum frequency error at the output of the receiver could have in reproducing the transmission.
3.
 - (a) Explain how FM modulation can be obtained using 'indirect method' with the help of neat block diagram.
 - (b) Bring out the differences between Wide and Narrow band Frequency Modulation.
4.
 - (a) Distinguish between envelop detection and synchronous detection methods.
 - (b) Explain the operation of limiter circuit in fm demodulation.
5.
 - (a) Draw the block diagram for a PLL FM transmitter and describe its operation
 - (b) For a given input signal, an FM broadcast band transmitter has a frequency deviation of 20 KHZ. Determine the frequency deviation if the amplitude of the modulating signal increases by a factor of 2.5.
 - (c) For an FM transmitter with 80 KHZ carrier swing, determine the frequency deviation. If the amplitude of the modulating signal decreases by a factor of 4, determine the new frequency deviation.
6. Write short notes on:
 - (a) Image frequency and its reduction. Image frequency and its reduction.
 - (b) Fading and diversity reception.
 - (c) Squelch circuit.

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
8. Show that the output SNR of a square law detector is inferior by 1.8db for tone modulation as compared to the envelope detector.

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