Electronic Communication

QUESTION BANK (GUJARAT UNIVERSITY)

1. Draw the block diagram of the basic communication system.
2. What is modulation? Why modulation is required?
3. Explain channel effect in detail with their resources. Also explain Nyquist information rate and channel capacity in detail
4. Give classification of electronics communication system based on types of channels and explain them in short.
5. State and prove the following Fourier transform properties: (1)Time scaling (2)Frequency shifting (3) Time integration property
6. Define the unit impulse signal. Find the Fourier transform of unit impulse signal and sinusoidal signal $\cos 2\pi f o$.
7. State the Parseval's theorem. Prove it for the signal: g (t) $= e^{-at} * u(t)$ $(a > 0)$
8. Explain briefly :1) signal energy and energy spectral density 2) signal power and power spectral density
9. Find Fourier transform of following: (i) $rect\left(\frac{t}{\tau}\right)$ (ii) $e^{-7|t|}$
10. Prove that ESD of any signal g(t) is the Fourier transform of the autocorrelation function $R_g(\tau)$
11. Estimate the essential bandwidth (W rad/s) of the signal $e^{-at} * u(t)$ if the essential band is required to contain 97% of the signal energy.
12. What is Phase Locked Loop? Draw the block diagram of Frequency Synthesizer using PLL and explain its operation in detail.
13. A carrier current is 8A but it is increase to 8.93A when it is modulated Find, (A) percentage modulation Index (B) Antenna current when modulation index changes to 0.8
14. Derive the expression for amplitude modulated wave.
15. Draw and discuss schematic diagram for FDM system to combine 4 voice channels each occupies a bandwidth of 6KHz. The common voice channel has a bandwidth of 24 KHz. (Band- 200 to 224 KHz).
16. AM modulating signal *8sin2π (900t)* is used to modulate a carrier signal *18 sin2 π (15,000t)*. Find modulation index, percentage modulation, frequencies of sideband components and their amplitude. Draw the spectrum of AM wave.
17. What are the different methods for generation of SSB signals? Explain SSB generation by phase shift method with necessary block diagram and derivations.
18. Draw and explain circuit of envelope detector for AM.
19. Draw the circuit diagram of ring modulator using diode and explain its operation.
20. Draw the block diagram of super heterodyne AM receiver and explain its operation in detail
21. Draw the block diagram of super heterodyne FM receiver and explain its operation in detail.

22. What do you mean by AGC? Draw the circuit diagram of delayed AGC and explain its operation. What are the advantages of delayed AGC?
23. Draw parallel tuned circuit and derive the equation for resonant frequency and Q factor.
24. Draw the circuit diagram of high frequency Transformer and derive the equation for transfer impedance.
25. Draw the circuit diagram of low frequency Transformer and derive the equation for reflected load.
26. Describe briefly shot noise, partition noise and flicker noise. Why they are generated?
27. Two resistors 10 kΩ and 25 kΩ are at room temperature (290K) for a bandwidth of 150kHz.Calculate thermal noise for each resistor, if two resistors are in series and if two resistors are in parallel.
28. Draw the block diagram of Tuned Radio Frequency (TRF) Receiver and explain its operation. Describe the problems in TRF receiver.
29. The RF amplifier working at 10 MHz has a bandwidth of 200 kHz. The input resistance of the stage is 1 kΩ with an equivalent shot noise resistance of 2 kilo-ohms. The receiver is connected to a 10 μV,75Ωsource.Calculate (1)equivalent noise voltage (2) Noise figure of the stage.
30. With respect to receivers explain Image rejection and double spotting in detail.
31. What do you mean by Tracking? Explain with figures: Padder tracking, trimmer tracking and three points tracking.
32. The frequency span to be received by a receiver is from 525 kHz to 1650 kHz. If Cmin of tuning circuit is limited to 50 pF, calculate the value of padder capacitor, if the maximum value of variable capacitor is 450 pF. The IF used is 465 kHz.
33. The equivalent noise resistance of an amplifier is 300 Ω and equivalent shot noise current is 5μA. The amplifier is fed from 150 Ω and 10μV rms sinusoidal signal source. Calculate the individual noise voltage at the input and the input Signal to Noise ratio in decibels. The noise bandwidth is 10 MHz.
34. What is Noise temperature and Noise factor ? Also derived the equation for Noise factor of amplifier in the cascading stages
35. Draw the block diagram of a double conversion receiver and explain each block in detail. Also list the additional circuits used to improve performance of communication receiver.
36. What is FM ? Give relation between FM and PM. Also give difference between AM and PM.
37. List all the basic FM demodulators, Draw and explain Foster seeley discriminator in detail.
38. Define noise factor. Drive the Friis's formula for noise factor when amplifiers are in cascade connection.
39. Discuss the importance of Pre-emphasis and De-emphasis circuits in FM broadcasting.
40. The noise figure of a receiver is 20dB and it is fed by a LNA which has a gain of 40dB and noise temperature of 80 K. Calculate the overall noise temperature of the receiver system and the noise temperature of the receiver.