Institute of Road and Transport Technology, Erode
Department of Electronics and Communication Engineering
Class/Sem: 2nd Year Information Technology-3rd Semester
Subject: Principles of Communication (IT)

BigQuestions

Unit – 1 Fundamentals of Analog Communnication

1. Illustrate time domain and frequency domain representation of standard AM with necessary mathematical representations and explanation for the conditions $|K_a m(t)|$ less than, equal to and greater than one, assuming both baseband and single tone sinusoid as a modulating signal.[POC, AU-2007]

2. A carrier of frequency 10^6 Hz and amplitude 3 volts is frequency modulated by a sinusoidal modulating signal frequency 500 Hz and of peak amplitude 1 Volt. The frequency deviation is 1 Khz. The level of the modulating waveform is changed to 5 V peak and the modulating frequency is changed to 2 Khz. Write the expression for the new modulated waveform. [POC,AU-2007]

3. An FM carrier is sinusoidally modulated. When does all the power lie in the sidebands (i.e. No power in the carrier)? [POC,AU-2007]

4. Describe the relationship between the instantaneous carrier phase and the modulating signal for PM. [POC, AU-2008]

5. Differentiate FM and PM. [POC,AU-2009]

6. Derive a relationship between total power and carrier power of AM. [POC,AU-2009]

7. Prove that after amplitude modulation the carrier power increases from P_c to $P_c[1+m_a^2/2]$, where m_a is the modulation index.[POC,AU-2010]

8. Derive the expression for modulation index of angle modulated waves. [POC,AU-2010]

9. Dicuss in detail about bandwidth requirements for angle modulated waves. [POC,AU-2011].

10. An antenna transmits an AM signal having a total power content of 15 Kw. Determine the power being transmitted at the carrier frequency and at each of the sidebands when the percent of modulation is 85%.[POC,AU-2011]

11. Explain in detail about Frequency Modulation. [POC,AU-2011]

12. If the signal $v(t)=20*\sin(6.28*10^6*t+10*\sin(6.283*10^3*t))$ represents a phase-modulated signal, determine the following:
(1). The carrier frequency (2). The modulation index (3). The peak phase deviation.[POC,AU-2011]

13. For an FM modulator with a peak frequency deviation Δf = 10 Khz, a modulating signal frequency fm = 10 Khz, Vc = 10 volts and a 500-KHz carrier, determine:
    1. Actual minimum bandwidth
    2. Approximate minimum bandwidth using carson's rule.
    3. Plot the output frequency spectrum.[POC,AU-2011]

14. Explain in detail about frequency analysis of angle modulated waves and its bandwidth requirements.[POC,AU-2012]

15. Write short notes on AM envelope and its frequency spectrum.[POC,AU-2012]

16. Compare frequency modulation and amplitude modulation.[POC,AU-2012]

17. Explain about AM percent modulation, AM voltage distribution and power distribution with neat sketch.[POC,AU-2012]

18. For amplitude modulation prove the following statments:
    (i). Power of the carrier Pc is unaffected by the modulation process.
    (ii). Total power in an AM envelope increases with modulation inndex.
    (iii). Modulation index $m = \frac{V_{max} - V_{min}}{V_{max} + V_{min}}$ draw the modulated waveform and show V_{max} and V_{min}.[ADC, AU-2006].

19. Derive the AM wave equation for tone modulation and explain each term with the help of frequenncy spectrum and also obtain an expression for its power saving and efficiency. [ADC,AU-2007].

20. Derive an expression for a single tone FM signal and draw its frequency spectrum. [ADC,AU-2007].

21. Define FM and PM modulation. Write their equations.[ADC, AU-2008].

22. Suppose that the modulating signal m(t) is a sinusoid of the form $m(t) = a\cos(2 * pi * f_m * t)$, f_m << f_c . Determine the AM signal, upper and lower sidebands, Draw the spectrum.[ADC, AU-2008].

23. For an AM DSBFC with a peak unmodulated carrier voltage V_c = 12V, and modulation coefficient m = 1 with load resistance R_L = 12Ω, determine the
    (1). Carrier power and the upper and lower side band power(P_C,P_{USB},P_{LSB}).
    (2). Total power of the modulated wave.
    (3). Draw the power spectrum.[ADC, AU-2009].

24. Compare AM and FM.[ADC, AU-2010,AU-2012].

25. Derive the relation between total power of AM and carrier power. [ADC, AU-2010].

26. Explain how Carson's rule of bandwidth in FM is obtained. For an FM modulator with peak frequency deviation Δf = 5 KHz, modulating frequency f_m = 5 KHz, with amplitude of carrier 5V and frequency 500 KHz, determine the bandwidth using

Carson's rule.[ADC, AU-2011].

27. For an AM DSBFC wave a peak unmodulated carrier voltage $V_C = 10\ V_P$, a load resistance $R_L = 10\ \Omega$ and a modulation coefficient m = 1, determine:
    (1). Power of the carrier, upper and lower side bands
    (2). Total power of the modulated wave
    (3). Total side band power
    (4). Draw the power spectrum. [ADC, AU-2011].

28. If the percentage of modulation is 100 %, how much percentage of the total power is present in the signal when DSB-SC is used.[ADC, AU-2012].

29. Define FM and PM modulation and write their equations.[ADC, AU-2012].

30. Derive the carrier power and transmitter power in AM in-terms of modulation index. [ADC, AU-2012].

Unit -2 Digital Communication

1. Draw the block diagram of FSK receiver and explain the operation. [ADC, AU-2006]

2. Explain the working of BPSK transmitter and receiver using balanced modulator. How M-ary encoding and modulation achieved in PSK? Draw a QPSK transmitter block diagram and explain the working principle.[ADC, AU-2006, AU-2007]

3. Derive an expression for baud rate in PSK and FSK systems.[ADC, AU-2008]

4. Explain the generation and detection of QPSK signals.[ADC,AU-2008]

5. Determine the baud rate and minimum bandwidth necessary to pass a 10 Kbps binary signal using amplitude shift keying.[ADC, AU-2008].

6. Explain quadrature amplitude modulation with the help of relevant diagrams. [ADC, AU-2008].

7. Draw the block diagram of FSK transmitter and receiver and explain the operation. How is the required bandwidth calculated for FSK?[ADC, AU-2009], [POC,AU-2011,AU-2012].

8. Draw the block diagram of QPSK transmitter and receiver and explain the operation. Also draw its phasor diagram and compare QPSK with simple BPSK in terms of bandwidth requirements.[ADC, AU-2009].

9. Determine the bandwidth efficiency for BPSK, QPSK and BFSK if bit rate is 64 Kb/sec.[ADC, AU-2010].

10. Draw the data signal, carrier signal and BPSK signal for the data 1 1 0 1 0 1. [ADC, AU-2010].

11. Draw the block diagram of a QPSK transmitter and explain. Derive the bandwidth requirement of a QPSK system.[ADC, AU-2010],[POC,AU-2011].

12. With neat diagram explain the generation of a DPSK signal and the method of recovering the data from the DPSK signal. [ADC, AU-2011].

13. Describe the procedure of coherent detection procedure of M-ary PSK with the help of block diagram.[ADC,AU-2012].

14. Determine the bandwidth efficiency of QPSK and compare it with other m-ary PSK transmitter.[ADC,AU-2012].

15. Explain the process of generating and detecting DPSK signal with the help of block diagram and given binary data sequence '0 0 1 0 0 1 0 0 1 1' assuming starting reference bit is “one”.[POC, AU-2007].

16. Explain the relationship between
    (1). The minimum bandwidth required for an FSK system and the bit rate and
    (2). The mark and space frequencies.[POC, AU-2008].

17. Explain how transmission and reception of FSK signals is done.[POC, AU-2008].

18. Compare BPSK and BFSK with respect to bandwidth efficiency and power. [POC, AU-2009].

19. Explain in detail about Costas loop carrier recovery with neat sketch.[POC, AU-2011].

Unit 3 Digital Transmisssion

1. Derive the SNR ratio for uniform quantizer. [ADC,AU-2006]

2. Draw the block diagram of delta modulator and explain the operations. What are its advantages over PCM?[ADC, AU-2006,AU-2007][POC,AU-2011]

3. What causes ISI in the detection process of a baseband digital system? Explain the effects of ISI. How ISI can be reduced?[ADC, AU-2006,AU-2012]

4. Explain in detail, how PCM signals are generated and decoded?[ADC,AU-2007]

5. Explain ISI for NRZ input signal.[ADC,AU-2008]

6. What is the need for companding? Explain analog and digital companding.[ADC, AU-2009].

7. Draw the block diagram of adaptive delta modulator and explain its operation. How is this ADM better than DM?[ADC,AU-2009,AU-2011]

8. What is ISI? Explain how ISI can be measured using eye pattern method. [ADC,AU-2009]

9. Explain Delta modulation PCM receiver. Desribe slope overload distortion and granular noise.[ADC,AU-2010]

10. In a binary PCM system, the output signal to quantization noise ratio is to be a minimum of 40 dB. Determine the number of required levels and find the corresponding output signal to quantization noise ratio.[ADC,AU-2010]

11. (i). Define Sampling theorem. (ii). Explain Adaptive delta modulation. [ADC,AU-2010]

12. Draw the eye diagram and explain its importance in data transmission. [ADC,AU-2011]

13. Explain the basic principle of differential PCM with relevant diagram. [ADC,AU-2011]

14. Discuss linear delta modulation using block diagram and derive expression for S/N ratio.[ADC,AU-2012].

15. A binary channel with bit rate = 36,000 bits/sec is available for PCM voice transmission. Find numer of bits per sample, number of quantization levels and sampling frequency assuming highest frequency component of voice signal is 3.2 Khz.[ADC, Au-2012].

16. List out the information provided by eye pattern about the system performance. [ADC,AU-2007]

17. Conisder a sinusoidal signal given by $S(t)=3*\cos(1000*\pi*t)$. Find the signal-to-quantization noise ratio when the signal is quantized using 10 bit PCM. Also find the minimum number of bits needed to achieve a signal-to-noise ratio of atleast 40dB.[POC,AU-2007]

18. What is the necessity of non-uniform quantization and explain companding? [POC, AU-2010]

19. Derive the expression for signal-to-quantization noise ratio for PCM system that employs linear quantization technique, assuming the input to the system is sinusoidal input signal.[POC,AU-2010]

20. Compare PCM,DM,ADM and DPCM.[POC,AU-2010]

21. What are the drawbacks in delta modualtion and how they are overcome in adaptive delta modulation?Explain it with neat diagram.[POC,AU-2011]

22. Define pulse modulation and explain about PCM circuit in detail.[POC,AU-2012]

23. Write a short notes on pulse transmission and intersymbol interference. [POC,AU-2012].

Unit 4 Spread Spectrum and Multiple Access Techniques

1. Draw the block diagram of a simple PN Sequence generator using shift register and obtain the output sequence. For this output sequence verify the properties of the PN Sequence. [ADC,AU-2006][POC,AU-2011].

2. Explain the process of Time Division Multiplexing and compare with FDM and Code Division Multiplexing.[ADC,AU-2007].

3. Give the advantages associated with spreading a signal spectrum. [ADC,AU-2008,AU-2012].

4. Describe the structure of feedback shift register for generating PN sequences. [ADC,AU-2008,AU-2012].

5. Explain FH-CDMA acquisition and tracking with neat sketches.[ADC,AU-2008].

6. Compare TDMA,FDMA and CDMA multiple access techniques.[ADC,AU-2008] [POC,AU-2009].

7. What are the properties of PN sequence random numbers? Draw the direct sequence spread spectrum system which employees BPSK and explain the operation.[POC,AU-2007,AU-2009,AU-2010][ADC,AU-2009,AU-2010].

8. What are fast frequnecy hopping and slow frequency hopping? Explain both with suitable diagrams.[ADC,AU-2009][POC,AU-2007,AU-2008,AU-2010].

9. Describe the properties of maximum length sequences.[ADC,AU-2010].

10. Explain fast and slow frequency hopping techniques in spread spectrum. [ADC,AU-2011].

11. Explain the concept of synchronization and tracking of frequency hopping spread spectrum signals.[ADC,AU-2012].

12. Mention merits and demerits of time division multiplexing.[ADC,AU-2012].

13. Describe any one method of source coding the speech signal for transmitting through wireless communication link.[ADC,AU-2012].

14. Explain a speech transmission technique that retains the quality of speech and employs a reduced transmission rate.[POC,AU-2008].

15. Describe coherent based DSSS with sutiable block diagram.[POC,AU-2008].

16. Describe the impairments of wireless communication networks.[POC,AU-2009].

17. Differentiate slow frequency and fast frequency hopping.[POC,AU-2010].

18. In a DS/BPSK system the feedback register used to generate PN sequence has the length of m = 15. The system is required to have an average probaility of symbol error less than 10^{-5}. Calculate processing gain and Jamming margin for the system.[POC,AU-2010].

19. Give a brief account on wireless communication.[POC,AU-2011].

20. Explain CDMA system with its features. List out various problems in CDMA system.[POC,Au-2011].

21. Explain in detail about multiple access techniques in wireless communication with neat diagram.[POC,AU-2012].

22. Generate PN sequence of length 7 using flip-flops.[POC,AU-2012]

Unit 5 Satellite and Optical Communication

Part-1 Optical Communication

1. Explain briefly the different light sources and detectors used in optical fiber communication.[POC,AU-2010]
2. Explain any two of the fiber losses in detail.[POC,AU-2011]
3. Write brief notes on LED.[POC,AU-2011]
4. Write short notes on
   (i). Numerical Aperture (NA)
   (ii).Avalanche Photodiode (APD).[POC,AU-2011]
5. Illustrate the advantages of optical fiber communication.[POC,AU-2011]
6. Explain in detail about the elements of optical fiber transmission link with neat block diagram.[POC,AU-2012]

Part-2 Satellite Communnication

1. Describe the satellite uplink block diagram and derive the expression for Up-link budget. [POC,AU-2010]
2. Briefly explain the characterictics of low, mdeium and high altitude satellites. [POC,AU-2010]
3. State Kepler's three laws of planetary motion. Explain their relevance to artificial satellites orbiting the earth.[POC,AU-2011]
4. With a neat diagram, explain briefly about the basic satellite communication systems. Also discuss its applications.[POC,AU-2012]