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KONGUNADU COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

REGULATION - 2017

YEAR/SEM: II/III **EC 8395 – COMMUNICATION ENGINEERING**

QUESTION BANK

UNIT I

ANALOG MODULATION

PART –A (2 MARKS)

1. Draw AM modulated wave for modulation index 0.5 and its spectra.**(April/May 2015)**
2. Define heterodyning.**(April/May 2015)**
3. For an AM system the instantaneous values of carrier modulating signal are 60 sinШct and 40sinШmt respectively determine modulation index.**(May/June 2014)**
4. State the differences between single side band and vestigial side band systems.**(May/June 2014)**
5. Draw the spectrum of VSB.What are the advantages of VSB-AM? **(April/May2015)(April/May2011)**
6. Draw the block diagram of SSB AM generator. **(Nov/Dec 2015)**
7. What is meant by frequency translation?**(Nov/Dec2013)**
8. Compare AM bandwidth, power requirement in terms of Pc with DSB-SC and SSB-SC. **(Nov/Dec2015)(May/June2016),(May/June2013)**
9. How many AM broadcast stations can be accommodated in a 100khz bandwidth, if the highestfrequency modulating carrier is 5KHz.**(Nov/Dec2013)(April/May 2010)(Nov/Dec2010)**
10. Suggest a modulation scheme for broadcast video transmission. **(Nov/Dec2016)(Nov/Dec2014)**
11. What are the types of AM modulators?
12. What is meant by diagonal clipping and negative peak clipping?
13. Define Coherent Detection.
14. Write the applications of Hilbert transform?
15. What are the methods for generating SSB-SC signal?
16. What is the need for modulation?
17. A transmitter radiates 9 kW without modulation and 10.125 kWafter modulation. DetermineDepth of modulation. Compare WBFM and NBFM.**(May/June2016)(Apr/May2015)(Apr/May2011)(Nov/Dec2011)(Apr/May2010)**
18. State the Carson's rule.**(May/June2016)(Apr/May2015) (Nov/Dec2015)(May/June2013)**
19. Why frequency modulation is more preferred for voice transmission?
20. List the advantages of AM and FM. **(Nov/Dec2014)**
21. What is meant by detection? Name the methods for detecting FM signals.**(Apr/May2011)**
22. A carrier is modulated by a sinusoidal modulating frequency of 2kHz resulting in a frequency deviation of 5kHZ.what is the bandwidth modulated by a carrier waveform? **(Apr/May2016)**
23. Define modulation index of FM and PM. **(Nov/Dec2016)(May/June2013)**
24. Draw the simple scheme of a PLL demodulator.**(Nov/Dec2013)**
25. What is the basic difference between an AM signal and a narrowband FM signal? **(Nov/Dec2015)**

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26. Define Direct method and Indirect method FM.**(Nov/Dec2011)**
27. What is the difference between FM and PM with blockdiagram?**(Apr/May2010)**
28. Define lock in range and dynamic range of a PLL.**(Apr/May2016)**
29. Draw the block diagram of a method for generating narrow band FM signal.**(Apr/May2010)**
30. What are the advantages of Ratio Detector?**(Nov/Dec2011)**
31. What are the applications of phase locked loop?
32. What do you understand by narrowband FM?
33. What are the two methods of producing an FM wave?
34. List the properties of the Bessel function.
35. What are the types of phase discriminator?
36. Write the advantages and disadvantages of foster-seeley discrimination method?
37. Differentiate between phase and frequency modulation.

PART –B

1. Explain with suitable diagrams the generation of AM (using square law method) and detection.**(8)(April/May 2015)((16)Nov/Dec2013)**
2. (i) Derive the equation of an AM wave. Also draw the modulated AM wave for various modulation index. Explain any one method to regenerate it. (16) **(Nov/Dec2016)(May/June2013)**
   (ii) The antenna current of an AM transmitter is 8 ampere when only the carrier is sent. The current increases to 8.93 A when the carrier is modulated by a single sine wave. Find the percentage modulation. (4) **(May/June2016)(May/June2013)**
3. Discuss the methods of demodulation of DSBSC AM signal using any one method (or) (costas loop).**(16)(April/May 2015)(Nov/Dec2015),(Nov/Dec2016)**
4. Explain the need for carrier suppression in AM system. Draw and explain the functioning of such system.(16) **(May/June 2014)**
5. (i) Compare the characteristics of DSBFC, DSBSC, SSBFC, SSBSC, SB schemes. (10) **(8)(April/May 2015),(April/May 2011)**
   (ii) Explain the Super heterodyne Receiver with a suitable block diagram.
   (6)**(16),(8)(April/May 2015)(16)(Nov/Dec 2015)(Nov/Dec2015)**
6. Explain the working of a AM transmitter and receiver with suitable diagram.**(16)(May/June 2014)**
7. Explain the generation of SSB SC signal using phase shift method.(10) **(Nov/Dec2014)**
8. Explain the function of switching modulator in the generation of AM signal.(8)
   (i) Discuss the concept of Hilbert transform.(4)**(8)(April/May 2015)**
   (ii)Draw the VSB spectrum and explain the significance.
   (4)**(Nov/Dec2013)(May/June2016)(May/June2013)**

9. (i) How do you demodulate AM signal? Explain. (8)**(16)(Nov/Dec 2015)**

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(May/June2016)(May/June2013)

(ii) A 1000 KHz carrier is simultaneously AM modulated with 300 Hz, 800Hz and 1.5 KHz audio sine waves. What will be the frequencies present in the output? (4) **(May/June2016),(May/June2013)**

10. (i) Draw an envelope detector circuit used for demodulation of AM and explain its operation. (10) **(April/May 2015),(April/May 2011)**

    (ii) How SSB can be generated using Weavers method? Illustrate with a neat block diagram. (6)

11. (i) With a neat block diagram explain the generation of DSB-SC-AM using balanced modulator.(8) **(Nov/Dec2013)**

    (ii) Write about the coherent detection method in detail for DSB-SC and SSB-SC .What happens when there is phase mismatch? (8)

    (iii)Explain the operation and applications of PLL as a FM demodulator. (6)**(Nov/Dec2016) (Apr/May2015)(Nov/Dec2014)**

12. (i) Explain direct method of FM generation.(8)**(Nov/Dec2016)(Apr/May2016)**

    (ii) Explain about ratio detector.(8)**(Nov/Dec2016)(Nov/Dec2011)**

13. (i) Explain the working principle of indirect method of generating a wide band FM.(8)**(Apr/May2015) (May/June2016)(Nov/Dec2014)(Nov/Dec2013)**

    (ii)Discuss the effects of nonlinearities in FMsystems.(8) **(May/June2016)(Apr/May2015)**

14. (i)Explain the Armstrong method of FM generation.(8) **(May/June2014)(May/June2013)(May/June2016)**

    (ii) Explain the functions of any FM detector circuit.(8) **(May/June2014)**

15. (i) Explain how FM is achieved using varactor diodes.(10)**(May/June2014)**

    (ii)Make at least five comparisons of AM and FM systems.(6) **(May/June2014)(May/June2013)**

16. With relevant diagrams explain how the frequency discriminator and PLL are used as frequency demodulators.(8)**(Nov/Dec2015)**

    (i) Draw the typical spectrum of the FM.(4) **(Nov/Dec2014)(May/June2013)**

    (ii) (ii) Differentiate Narrowband and Wideband FM. (4) **(Nov/Dec2011)(Apr/May2010)**

17. (i) Explain the FM foster seeley discriminator with a suitable diagram.(10) **(May/June2016)(Apr/May2016)(Apr/May2015)(May/June2016)**

    (ii)How FM can be derived from PM and vice versa. Explain in detail.(6) **(May/June2013)**

    With necessary diagrams explain the operation of slope detector for demodulating FM signal. (8) **(Apr/May2011)**

PART – C

1. (i) An AM signal is generated by modulating the carrier fc=800MHz by the signal m(t) = sin 3000πt+0.5cos5000πt. the AM signal s(t)=100[1+m(t)]cos2πfct is fed to a 50 ohm load. (8)
    1. Determine the average power in the carrier and in the sidebands.
    2. Find the modulation index and peak power delivered to the load.**(Nov/Dec2015)**
2. (i) Explain about the generation of DSB-SC using ring modulator. (10)

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(ii) For an AM DSBFC wave with peak unmodulated carrier voltage Vc =10V, a load resistance RL=10Ω and a modulation coefficient ma =1, determine

a) Powers of the carrier and the upper sidebands (6)

b) Total sideband power

c) Total power of the modulated wave

d) Draw the power spectrum.

3. A 20 Mhz is frequency modulated by sinusoidal signal such that the maximum frequency deviation is 100khz. Determine the modulation index and approximate bandwidth of the FM signalfor the following modulating signal frequencies.

   (i) 1 Khz (ii) 100 Khz (iii) 500 Khz. (8)**(Apr/May2010)(Nov/Dec2010)**

4. A carrier frequency of 80MHZ is frequency modulated by a sine wave amplitude of 20volts andfrequency of 80MHZ.the frequency sensitivity of the modulator is 20KHZ/vdf. (16) **(Nov/Dec2013)**

   (i) Determine the appropriate bandwidth of the FM wave by using carsons rule. **(Nov/Dec2013)**

   (ii) Determine the bandwidth by transmitting only those frequencies whose amplitudeexceed 1% of the unmodulated carrier amplitude.**(Nov/Dec2013)**

5. When the modulating frequency in an FM system is 400Hz and the modulating voltage is2.4V the modulation index is 60.Calculate the maximum deviation. What is the modulating Index when the modulating frequency is reduced to 250Hz and the modulating voltage is simultaneously raised to 3.2V? (8) **(May/June2013)**

UNIT II
PULSE MODULATION

PART –A (2 MARKS)

1. State the 2 properties of linear prediction.
2. Differentiate PCM and DPCM.
3. What is prediction gain? State its significance.
4. What is delta modulation?
5. Define pulse code modulation.
6. Mention the drawbacks of DM.
7. The idle channel noise in a delta modulator is negligibly small. Justify the
8. validity of this statement.
9. What is slope overload and granular noise?
10. State the principle of ADM.
12. Compare DM and ADM.
13. Define ADPCM.
14. What are the different types of adaptive quantization?

PART –B

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1. What is DM? Explain the transmitter and receiver of DM system. (13)
2. Explain a DPCM system with the expressions and block diagram.
3. Show that SNR of DPCM is better than that of PCM. (13)
4. Explain the noises in delta modulation systems. How to overcome this effect in Delta modulation? (13)
5. With necessary diagrams, explain ADPCM system. (13)
6. Explain PCM with a neat block diagram.
7. Explain PCM sampling with necessary diagrams and circuits. Write a note on aliasing and quantization.
8. With a neat block diagram explain Delta modulation. How slope over and granular noise can be minimized and discuss in detail about Adaptive delta modulation.
9. With a neat block diagram explain DPCM transmitter and receiver.

UNIT III
DIGITAL MODULATION AND TRANSMISSION

PART –A (2 MARKS)

1. Define BPSK and DPSK.
2. Why is PSK always preferable over ASK in Coherent detection?
3. What are the drawbacks of binary PSK system?
4. A BFSK system employs two signaling frequencies f1 and f2. The lower frequency f1 is 1200 Hz and signaling rate is 500 Baud. Calculate f2.
5. What are the advantages of QPSK over PSK?
6. What is constellation diagram?
7. A BPSK system makes errors at the average rate of 100 errors per day. Data rate is 1 Kbps. The single-sided noise power spectral density is 10 W/Hz.
8. Assume the system to be wide sense stationary, what is the average bit error probability?
9. Define QAM and draw its constellation diagram for M=8.
10. Write the special features of QAM.
11. Differentiate coherent and non-coherent detection.
12. Define spectral efficiency.
13. What is meant by symbol synchronization?
14. List out the difference between carrier recovery and clock recovery.
15. Compare the error probability for BPSK and QPSK.
16. What is the error probability of DPSK?
17. Write the features of DPSK.
18. What is meant by memoryless modulation?
19. What is ISI and give its causes.
20. What is an eye pattern?
21. List the significance of eye pattern.

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PART –B

1. Explain the generation and detection of binary PSK. Also derive the probability of error for PSK.
2. With constellation diagram, explain the QAM transmitter. Also derive its power spectral density.
3. Briefly discuss about the Non-coherent detection of PSK and QPSK. (13)
4. Briefly discuss about the principle of DPSK system. (13)
5. Discuss about coherent detection of QPSK and derive its power spectral density.
6. Write notes on ISI and eye pattern.

UNIT IV
INFORMATION THEORY AND CODING

PART –A (2 MARKS)

1. State the channel coding theorem.
2. What are the objectives of channel coding?
3. Define coding efficiency.
4. Define Hamming distance and calculate its value for two code words 11100 and 11011.
5. Define Hamming weight and minimum distance.
6. State the significance of minimum distance of a block code.
7. State the principle of error free communication.
8. Define linear block codes.
9. Write syndrome properties of linear block codes.
10. What is Hamming codes?
11. Write the advantages and disadvantages of Hamming codes.
12. Define syndrome vector.
13. Mention the properties of cyclic code.
14. State any 2 properties of generator polynomial.
15. What are the advantages and disadvantages of cyclic code?
16. What is convolutional code? How is it different from block codes?
17. Mention the structural properties of a convolutional encoder.
18. What is meant by BCH code?
19. Define CRC codes.
20. What is Viterbi decoding scheme?
21. Define Shannon's channel capacity theorem.**(Nov/Dec2016) (April/May2016)(Nov/Dec2011) (Nov/Dec2014)May/June 2014)(Nov/Dec2015)**
22. What is lossy source coding?**(May/June 2016)**
23. Define entropy and its property.**(April/May2015)(Nov/Dec2014) (April/May2010)(April/May2011)(May/June2013)(April/May2015)**
24. Define entropy and find the entropy of a DMS with probability s1=1/2,s2=1/4,and s3=1/4.**(April/May2015)**

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25. Define rate band width and bandwidth efficiency.**(Nov/Dec2010)(April/May2010)**
26. Define mutual information and channel capacity.**(May/June2016)(May/June2013)**
27. State source coding theorem.**(Nov/Dec2015)**
28. State channel coding theorem. **(Nov/Dec2016)**
29. What is the channel capacity of BSC and BEC?**(April/May2015)April/May2015)**
30. Define entropy for a discrete memory less source. **(Nov/Dec2013)**
31. A source is emitting symbols x1,x2 and x3 with probabilities respectively 0.6,0.3,and 0.1 what is the entropy of the source?**(April/May2016)(Nov/Dec2011)**
32. A source emits one of the four symbols A, B, C and D with probabilities 1/3, 1/6, 1/4. Respectively the emissions of symbols by the source are statistically independent. Calculate the entropy of the system. **(Nov/Dec2014)**
33. What is lossy source coding?**(May/June2016)**
34. Differentiate between lossless and lossy coding. **(April/May2011)**
35. A telephone network has a bandwidth of 3.4kHz ,Calculate the information capacity of the telephone channel for a signal-to-noise ratio of 30dB.**(May/June2013)**
36. The average information rate is zero for both extremely likely and extremely unlikely message. Is the statement is correct?Why?**(May/June2016)**
37. List the properties of Entropy. **(May/June2013)**
38. A source generates a message with probabilities of 0.5, 0.25, 0.25 calculate source entropy. **(Nov/Dec2016)(Nov/Dec2010)**
39. For a discrete memoryless channel define channel capacity as per Shannon.**(Nov/Dec2013)**
40. What is prefix code?
41. Define information rate.
42. What is channel redundancy?
43. Give the equation for finding the entropy of a binary source.
44. When is the average information delivered by a source of alphabet size 2, maximum?
45. Name the source coding techniques.
46. What is channel capacity of binary synchronous channel with error probabilityof 0.2?
47. Write the expression for code efficiency in terms of entropy.
48. Is the information of a continuous system non negative? If so, why?
49. Explain the significance of the entropy H(X/Y) of a communication system where X is the transmitter and Y is the receiver.
50. An event has six possible outcomes with probabilities½.1/4,1/8,1/16,1/32,1/32. Find the entropy of the system.

PART B

1. State shannon's various theorems and explain.**(Nov/Dec2016)(May/June2013) (Nov/Dec2011)**

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2. A discrete memory less source has five symbols X1,X2,X3,X4 and X5 with probabilities 0.4,0.19,0.16,0.15, and 0.15 respectively attached to every symbol.
   (i) Construct a Shannon – fano code for the source and calculate code efficiency.
   (ii) Construct Huffman code and compare two source code efficiency.**(16) (Nov/Dec2016)**
3. Derive the mutual information I(x,y) for a binary symmetric channel, when the probability of source is equally likely and the probability of channel p=0.5. (6)**(April/May2016)**
4. A source emitting three symbols with probabilities P(X)=(1/8,1/4,5/8) and P(Y) is given in the table, where X and Y represent the set of transmitted and received symbols respectively, compute H(X),H(X/Y) and H(Y/X). (10) **(April/May2016)**

		y1	y2	y3
	x1	2/5	2/5	1/5
P(Y/X)	x2	1/5	2/5	2/5
	x3	2/5	1/5	2/5

5. Find the Huffman coding for the probabilities P=(0.0625,0.25,0.125,0.25,0.125,0.0625) and the efficiency of the code.(8)**(April/May2015)(May/June2013)**
6. Differentiate and Explain lossless and lossy coding.(8)**(April/May2015)(Nov/Dec2014)(Nov/Dec2013)**
7. A discrete memory less source emits 4 symbols each with probability 0.25,construct Shannon fano codes and Huffman code for this source.(10)**(May/June2016)**
8. Discuss in detail about bandwidth –S/N tradeoff.**(May/June2016)**
9. Find the capacity of a telephone channel with bandwidth 3000 Hz and SNR 39dB.(3)**(May/June2016)(May/June2013)**
10. State the physical meaning of entropy. Determine the entropy of a discrete memoryless source emitting 5 symbols each with probality 0.2.(3)**(May/June2016)**
11. Write short notes on: (i) Mutual information (ii) Rate distortion theory (10)**(May/June2016)**
12. Discuss Source coding theorem, give the advantage and disadvantage of channel coding in detail, and discuss the data compaction .
13. (i) Construct a Shannon-fano code for the source and calculate code efficiency.
    (ii) Construct Huffman code and compare the two source coding.**(Nov/Dec2016)(April/May2015)(April/May2016)**
14. Consider a discrete memoryless source with seven possible symbols Xi={1,2,3,4,5,6,7} with associated probabilities Pr={0.37,0.33,0.16,0.04,0.02,0.01} construct the Huffman's code and Shannon-fano code and determine the coding efficiency and redundancy.(16)**(April/May2016)**
15. (i) Explain in detail Huffman coding algorithm and compare this with the other types of coding .(12) (16) **(Nov/Dec2016)(May/June 2014)(Nov/Dec2014)(Nov/Dec2013)**
    (ii)Write short note on S/N trade off. (4) **(Nov/Dec2013)**
16. Using Huffman code I encode the following symbol, S={0.3,0.2,0.25,0.12,0.05,0.08},calculate (i) Average code word length (ii) entropy of the source (iii) code efficiency (iv) redundancy (16)**(April/May2011)**
17. State and prove properties of mutual information.(6) **(April/May2011)(Nov/Dec2011)**

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18. (i)Explain how channel capacity could be improved. Explain the S/N trade off in detail. (8) **(May/June 2014)**
    (ii)Explain the need for source coding and channel coding. (8) **(May/June 2014)**
19. Write short notes on Differential entropy, derive the channel capacity theorem and discuss the implications of the information capacity theorem.(13)
20. What do you mean by binary symmetric channel? Derive channel capacity formula for symmetric channel.(8)
21. Construct a single error correcting (7, 4) linear block code and the corresponding decoding table. (13)
22. (i) Explain the generation of (n, k) blocks codes and how block codes can be used for error control. (10)
    (ii) Explain the syndrome decoder for cyclic codes. (6)
23. Consider a (7, 4) linear block code whose parity check matrix is given by
    H =
    (i) Find the generator matrix.
    (ii) How many errors this code can detect?
    (iii) How many errors can this code be corrected?
    (iv) Draw circuit for encoder and syndrome computation. (13)
24. The generator polynomial of a (7, 4) Hamming code is defined by
    g(D) = 1 + D2 + D3
25. Develop the encoder and syndrome calculator for this code. (13)
    (i) Find a generator polynomial for a (7, 4) cyclic code and hence find the code word for [1 1 0 0]. (8)
    (ii) Construct the encoder for (7, 4) cyclic codes. (8)
26. Explain how encoding is done by convolutional codes with an example. (13)
27. For (6, 3) systematic linear block code, the code word comprises I1, I2, I3 and P1, P2, P3 where the three parity check bits are formed from the information bits as follows:
    P1 = I1 I2
    P2 = I1 I3
    P3 = I2 I3
    Find: (i) Parity check matrix and generator matrix (3)
    (ii) All possible code words. (3)
    (iii) Minimum weight and minimum distance. (3)
    (iv) Error detecting and correcting capability of the code. (3)
    (v) If the received sequence is 101010, calculate the syndrome and decode the received sequence. (4)
28. Describe the steps involved in the generation of linear block codes. Define and explain properties of syndrome. (13)
29. Explain Viterbi algorithm to decode a convolutionally coded message.(13)
30. Design a convolutional coder of constraint length 6 and rate efficiency 1/2.
31. Draw its tree diagram and trellis diagram. (13)

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PART C

1. Derive the expression for channel capacity of a continuous channel. Find also theexpression for channel capacity of continuous channel of a infinite bandwidth. Comment on the results.
2. Source emits one of the four symbols A, B, C and D with probabilities 1/3, 1/6, ¼ respectively the emissions of symbols by the source are statistically independent.Design a Shannon Fano code for the source. Determine the average code length and efficiency.(16) **(Nov/Dec2014)**
3. Construct binary optical code for the following probability symbols using HuffmanProcedure and calculate entropy of the source, average code Length, efficiency, Redundancy and variance 0.2, 0.18, 0.12, 0.1, 0.1, 0.08, 0.06, 0.06, 0.06, 0.04.
4. Two binary random variable X and Y are distributed according to the joint PMF given by P(X=0,Y=1)=1/4;P(X=0,Y=1)=1/4;P(X=1,Y=1)=1/2;P(X=1,Y=1)=1/4:DetermineH(X,Y),H(X),H(Y),H(X/Y) and H(Y/X).(8) **(Nov/Dec2015)**
5. Explain the properties of entropy and with suitable example, explain the entropy of binary memory less source.(8)**(Nov/Dec2016)**

UNIT V
SPREAD SPECTRUM AND MULTIPLE ACCESS

PART –A (2 MARKS)

1. Define CDMA.
2. Define Multiple Access and what are the major types of Multiple Accesses?
3. What is TDMA?
4. What are the features of code division multiple accesses?
5. What is the significance of spread spectrum?
6. What is the use of special code in spread spectrum?
7. Where spread spectrum is used?
8. What are the two types of spread spectrum?
9. What is the Meaning of the word jamming and anti-jam?
10. What is jamming margin?
11. What is meant by PN sequence and what are the properties of PN sequence?
12. Define chip duration and chip rate.
13. What is the shape of auto-correlation function of PN sequence?
14. Define slow frequency hopping.(Nov/Dec 2015).
15. What is near-far problem?(May/June 2014)
16. What are the popular coding sequences of CDMA system(Nov/Dec 2014)
17. Explain frequency hop spread spectrum. (Nov/Dec 2015).
18. Any 4 applications of FDMA.(April/may 2015)

PART B

1. Explain CDMA and also give the orthogonal condition of the signals in CDMA.
2. Explain about various multiple access schemes.
3. Discuss the concept of TDMA techniques and mention its merits and demerits.

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4. With neat block diagram, explain the operation of typical FDMA system.
5. Compare CDMA.TDMA,FDMA system.
6. Illustrate how interference is avoided by using code division multiplexing.

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