Electronics and Communication Engineering
EC 2252 Communication Theory
Model Question paper -1

Time: Three Hours Maximum: 100 marks

Answer ALL Questions
Part A - (10 x 2 = 20 marks)

1. What are the advantages of Vestigial Side Band?
2. Compute the bandwidth of the Amplitude modulated signal given by S(t)= 50 [1+0.7 cos (350t)]cos($270000\pi t$)
3. Distinguish between narrow band FM and wide band FM.
4. What is meant by detection? Name the methods for detecting FM signals.
5. Write the Rayleigh and Rician probability density functions.
6. What is white noise? State its power spectral density.
7. Compare the noise performance of DSBSC receiver using coherent detection with AM receiver using envelope detection.
8. What are the methods to improve FM threshold reduction?
9. Define entropy function.
10. Differentiate between lossless and lossy coding.

Part B - (5 x 16 = 80 marks)

11. (a) With a help of a neat diagram, explain the operation of an envelope detector. Why does negative peak clipping take place? (16)

OR

(b) (i) Compare the characteristics of DSBFC, DSBSC, SSBSC, VSB schemes. (4)
(ii) Explain the concept of FDM with a suitable block diagram. (6)
(iii) The antenna current of an AM transmitter is 8 ampere when only the current is sent. The current increases to 8.39 A when carrier is modulated by a signal sine wave. Find the percentage modulation (4)

12 (a) (i) Derive the expression for the single tone frequency modulation and draw its frequency spectrum. (8)
(ii) An angle modulated wave is described by the equation V (t) = 10 cos(2 x106πt + 10 cos 2000πt). Find (1) Power of the modulated signal (2) Maximum frequency deviation (3) Bandwidth. (8)

OR

(b) (i) A 100 kHz carrier is frequency modulated to produce a peak deviation of 800 Hz. This FM signal is passed through a 3 by 3 by 4 frequency multiplier chain, the output of which is mixed with an oscillator signal and the difference frequency taken as the new output. Determine the frequency taken as the new output. Determine the frequency of the oscillator required to produce a 100 kHz FM output and the peak deviation of the output. (4)
(ii) With necessary diagrams explain the operation of slope detector for demodulating FM signal. (12)

13. (a) State and prove four properties of Gaussian process. (16)

OR

(b) (i) Derive the expression for shot noise, its mean, autocorrelation & Power density spectrum. (10)
(ii) Consider two amplifiers are connected in cascade. First stage amplifier has gain and noise figure as 10 dB and 2 dB. Second stage has noise figure of 3 dB. Calculate total noise figure. (6)

14. (a) (i) Sketch the block diagram of DSB-SC/AM system and derive the figure of merit. (8)
(ii) Using superheterodyne principle, draw the block diagram of AM radio receiver and briefly explain it. (8)

OR

(b) (i) Derive the figure of merit of a FM system . (10)
(ii) Compare the performances of AM and FM systems. (6)

15. (a) Using Huffman code I, encode the following symbols. (8)
S = [0.3, 0.2, 0.25, 0.12, 0.05, 0.08,] Calculate (i) Average codeword length , (ii) Entropy of the source
(iii) Code efficiency and (iv) Redundancy (8)

OR

(b) (i) State and prove the properties of mutual information. (10)
(ii) The channel transition matrix is given by ·
0.9 0.1
0.2 0.8 . Draw the channel diagram and determine the probabilities associated with outputs assuming equi probable inputs. (6)

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Model Question paper -2

Time: Three Hours Maximum: 100 marks

Answer ALL Questions

Part A - (10 x 2 = 20 marks)

1. Compare AM, DSB-SC, SSB and VSB wave?
2. Define modulation index of AM signal..
3. Compare Frequency and Phase modulation.
4. Convert NBFM to WBFM?
5. Define noise figure.
6. Define Thermal noise.
7. Define Figure of merit.
8. Define pre-emphasis and de-emphasis
9. What is channel redundancy?
10. State Shannon's theorem.

Part B - (5 x 16 = 80 marks)

11. ((i) Explain Frequency Translation. (8)
(ii) Derive the equation of an AM wave. Also draw the modulated AM wave for various modulation index. (8)

OR

(b(i) Explain the generation of SSB signal. (10)
(ii) Show that an AM can be recovered, irrespective of value of % modulation by using synchronous detection technique. (6)

12 (a) (Draw the circuit diagram of Foster-Seeley discriminator and explain its working. (16)

OR

(b) (i) Explain the Armstrong method for generation of FM signal with block diagram. (10)
(ii) A modulating signal 5cos $2\pi 15*1000t$ angle modulates a carrier $A\cos\omega t$. Find the modulation index & bandwidth for FM system & determine the change in bandwidth & modulation index for FM if f_m is reduced by 5 KHz. (6)

13. (a) Derive the effective noise temperature of a cascade amplifier. Explain how the various noises are generated and the method of representing them**.** (16)

OR

(b) Discuss the following:

i) noise equivalent bandwidth **(4)**
ii) narrow band noise **(4)**
iii) noise temperature **(4)**
iv) noise spectral density **(4)**

14. (a) Explain the working of AM & FM Superheterodyne receivers with its parameters. (16)

OR

(b) Derive the expression for output signal to noise for a DSB-SC receiver using coherent detection. **(16)**

15. (a) Discuss Source coding theorem, give the advantage and disadvantage of channel coding in detail, and discuss the data compaction**.** (16)

OR

(b) Five symbols of the alphabet of discrete memory less source and their probabilities are given below. (8)

S=[S0,S1,S2,S3,S4]
P[S]=[0.4,0.2,0.2,0.1,0.1] Code the symbols using Huffman coding.

(ii) Derive the channel capacity of a continuous band limited white Gaussian noise channel **(8)**

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Model Question paper -3

Time: Three Hours Maximum: 100 marks

Answer ALL Questions

Part A - (10 x 2 = 20 marks)

1. An AM transmitter radiates 9KW without modulation & 10.125KW after modulation. Determine the depth of modulation
2. What is meant by coherent detection?..
3. Define frequency deviation in FM?
4. Why Armstrong method is superior to reactance modulator
5. What is a random process?.
6. Find the thermal noise voltage developed across a resistor of 700ohm. The bandwidth of the measuring instrument is 7MHz and the ambient temperature is 27'C.
7. Draw the Phasor representation of FM noise.
8. Define SNR.
9. What is channel capacity of binary synchronous channel with error probability of 0.2?
10. Explain rate distortion theory

Part B - (5 x 16 = 80 marks)

11. ((i) Explain DSB-SC generation using Ring modulator (12)
(ii) Write notes on FDM. (4)

OR

(b(i) Discuss the generation and detection scheme for standard AM. (10)
(ii) Draw the filtering scheme for the generation of VSB modulated wave & explain. (6)

12 (a) Derive the expression for the frequency modulated signal. Explain what is meant by narrow band FM and wide band FM? (16)

OR

. (b) (i) Explain how varactor diode can be used for frequency modulation. (6)
(ii) Explain ratio detector with merits and demerits . (10)

13. (a) Explain how the various noises are generated and the method of representing them. (16)

OR

(b) (i)What is narrowband noise? Discuss the properties of inphase and quadrature phase components of a narrowband noise. (8)
(ii)What is meant by noise equivalent bandwidth? Illustrate it with a diagram (8)

14. (a) Define and Explain FM Threshold effect. With suitable diagram, explain threshold reduction by FMFB demodulator. (16)

OR

(b) Draw the block diagram of FM demodulator and explain the effect of noise in detail. Explain the FM threshold effect? (16)

15. (a) Define mutual information. Find the relation between the mutual information and the joint entropy of the channel input and channel output. Explain the important properties of mutual information. (16)

OR

(b) (i)Five symbols of the alphabet of discrete memory less source and their probabilities are given below. (8)

S=[S0,S1,S2,S3,S4]

P[S]=[0.4,0.2,0.2,0.1,0.1]

Code the symbols using Shannon fano coding.

(ii) Explain the properties of entropy and with suitable example, explain the entropy of binary memory less source. (8)