Code: 15A04402 **R15**

B.Tech II Year II Semester (R15) Supplementary Examinations December 2018

ANALOG COMMUNICATION SYSTEMS

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) A 400 Watt carrier is modulated to a depth of 80%. Calculate the total power in the modulated wave.

(b) What are the advantages of SSB modulation?

(c) What is frequency modulation and write the expression for instantaneous frequency?

(d) With block diagram, show how FM can be obtained using PM.

(e) Define white noise and write expression for power spectral density of white noise.

(f) Define signal to noise ratio and figure of merit.

(g) Describe in brief the sampling theorem in frequency domain.

(h) Write the advantages of PAM.

(i) Consider a binary source with source alphabet probabilities $P = \left\{\frac{1}{256}, \frac{255}{256}\right\}$. Find the entrophy.

(j) State Shannon Hartley theorem.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Illustrate the working of ring modulator for sinusoidal modulating wave n(t) and also obtain the o/p equation for ring modulator.

(b) An audio frequency signal 10 sin2π X 500 t is used to amplitude modulate a carrier of 50 sin2π X 10^5 t. Assume modulation index = 0.2. Find the following: (i) Sideband frequencies. (ii) Amplitude of each sideband frequencies. (iii) Bandwidth required. (iv) Total power delivered to the load of 600 Ω.

OR

3 (a) Describe the principle of QAM with functional block diagram.

(b) The output voltage of a transmitter is given by 400(1+0.4 cos6280 t) cos 3.14 x 10^7 t. This voltage is fed to a load of 80 Ω resistance. (i) Determine carrier frequency. (ii) Modulating frequency. (iii) Carrier power. (iv) Total power o/p.

UNIT – II

4 (a) Explain the generation of narrow band frequency modulation (NBFM) using Armstrong technique.

(b) An angle modulated signal s(t) is given by the equation:$s(t) = 12\cos(12\pi 10^8 t + 200\cos 2\pi 10^3 t)$. Find its bandwidth.

OR

5 (a) Analyze the FM demodulation using PLL.

(b) A sinusoidal modulating waveform of amplitude 10 V and a frequency of 1 kHz is applied to an FM generator that has a frequency sensitivity content of 40 Hz/volt. Determine the: (i) Frequency deviation. (ii) Modulation index.

Contd. in page 2

UNIT – III

6 (a) Derive the equation for (SNR)o of DSB-SC receiver.

(b) A carrier reaching an envelope detector in an AM receiver has an RMS value equal to 1 volt in the absence of modulation. The noise at the input of the envelop detector has a PSD equal to 10^{-3} watts/Hz. If the carrier is modulated to a depth of 100% and message bandwidth w = 3.2 kHz. Find output signal-to-noise ratio (SNR)o.

OR

7 (a) Obtain (SNR)o equation for FM receiver.

(b) An FM signal with a deviation of 75 kHz is applied to an FM demodulator. When the input SNR is 15dB, the modulating frequency is 10 kHz, estimate the SNR at the demodulator output.

UNIT – IV

8 (a) State and prove sampling theorem for band limited signals.

(b) Specify the Nyquist rate and Nyquist interval for each of the following signals:

(i) x(t) = sin c (200t).

(ii) x(t) = sin c^2 (200t).

OR

9 (a) Describe the generation and demodulation of PAM.

(b) Twelve different message signals, each of bandwidth 10 kHz are to be multiplexed and transmitted. Determine the minimum bandwidth required for PAM/TOM.

UNIT – V

10 (a) State and prove the properties of entrophy.

(b) A black and white TV-picture consists of 525 lines of picture information. Assume that each line consists of 525 picture elements and that each element can have 256 brightness levels. Pictures are repeated at the rate of 30 frames/sec. Calculate the average rate of information conveyed by a TV set to a viewer.

OR

11 Prove the identity H(x, y) = H(x/y) + H(y).

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PART – A

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Give the principle of frequency translation.
(b) Discuss the significance of carrier in AM.
(c) Give the relation between FM and PM.
(d) State the necessity of IF stage in super heterodyne receiver.
(e) Define noise equivalent bandwidth and explain the same.
(f) Discuss the choice of AM / FM for video/audio signal transmission.
(g) State the necessity low pass filter used before sampling.
(h) Compare different pulse modulation schemes.
(i) Define entropy and model the same.
(j) Briefly give the properties of discrete memory less channels.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Give the significance of VSB and characterize the VSB filter used for television signal transmission.
(b) Draw the envelope of AM and deduce the power relations.

OR

3 (a) Define modulation index of AM and justify the upper bound of the same.
(b) Discuss the impact of phase errors in the detection of DSBSC.

UNIT – II

4 (a) Explain FM detection by ratio detector.
(b) Deduce the upper and lower limits on RC time constant of envelop detector used to demodulate single tone AM signal.

OR

5 (a) Explain the impact of increasing the modulation index on the spectrum of FM with appropriate spectral diagrams.
(b) Discuss operating principle of PLL.

UNIT – III

6 (a) Deduce the SNR of AM with envelope detection.
(b) Discuss different types of noise and quadrature representation of narrow band noise.

OR

7 (a) Deduce the SNR of PM.
(b) By using the pre-empasis filter with a voice signal as the modulating wave, an FM transmitter produces a signal that is essentially frequency modulated by the lower audio frequencies and phase modulated by the higher audio frequencies. Explain the reasons for this phenomenon.

UNIT – IV

8 (a) State and prove sampling theorem.
(b) With the help of experimental setup, explain how will you determine sensitivity, selectivity and fidelity of radio receiver.

OR

9 (a) Explain the generation of PPM.
(b) Discuss the bandwidth and noise tradeoffs in various pulse modulation schemes.

UNIT – V

10 (a) A discrete memory less source X has five symbols x_1, x_2, x_3, x_4, x_5 with respective probabilities 0.2, 0.15, 0.05, 0.1 and 0.5. Construct a Shannon-Fano code for X, and calculate the code efficiency.
(b) Discuss the properties of entropy and derive an expression for the same.

OR

11 (a) Deduce the entropy of a binary memory less channel.
(b) Discuss the properties of mutual information.

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R15

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) State the necessity of modulation.

(b) Plot the spectrum of AM.

(c) State the bandwidth requirement of FM with the help of appropriate diagram.

(d) Why local oscillator frequency in super heterodyne radio receiver is chosen to be the incoming signal frequency?

(e) Define noise temperature and give the significance of the same.

(f) Discuss the necessity of pre-emphasis and de-emphasis in FM.

(g) Give the bandwidth requirements of pulse code modulation.

(h) Discuss briefly aperture affect with respect to sampling.

(i) State Shannon Hartley theorem.

(j) Plot the variation of channel capacity of a binary symmetric channel against the transition probability and explain the same.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Sketch the spectrum of DSB-SC wave given by: $S(t) = A_c\, sin(2\pi\, 10^2 t) cos(2\pi\, 10^5 t)$.

(b) Discuss SSB transmitter and receiver with the help of appropriate quantitative analysis and diagrams.

OR

3 (a) Draw the block diagram for generation of DSB-SC wave using two AM modulators. A DSB-SC wave is demodulated using coherent detector. Evaluate the effect of frequency error in local carrier frequency of detector.

(b) Discuss in detail QAM.

UNIT – II

4 (a) Give the bandwidth relationship using Carson's rule in FM.

(b) Explain FM generation using indirect method.

OR

5 (a) Draw the phasor diagrams of NBFM & AM and compare them. A carrier is frequency modulated with a sinusoidal of 2 kHz resulting in a maximum frequency deviation of 5 kHz.

(i) Find the bandwidth of the modulated signal.

(ii) The amplitude of the modulating sinusoid is increased by a factor of 3, and its frequency is lowered to 1 kHz. Find the maximum frequency deviation and the bandwidth of the new modulated signal.

(b) Discuss the choice of selection of IF in super heterodyne radio receiver.

UNIT – III

6 (a) Give the quadrature representation of narrowband noise.

(b) Deduce the SNR of DSBSC.

OR

7 (a) Discuss FM threshold.

(b) Derive an expression of SNR of AM.

Contd. in page 2

UNIT – IV

8 (a) Deduce the requirements posed by PAM signal on magnitude and phase responses of the channel and show that noise performance of PAM system can never be better than the base band signal transmission.

(b) With the help of experimental setup, explain how will you determine Sensitivity, Selectivity and Fidelity of radio receiver.

OR

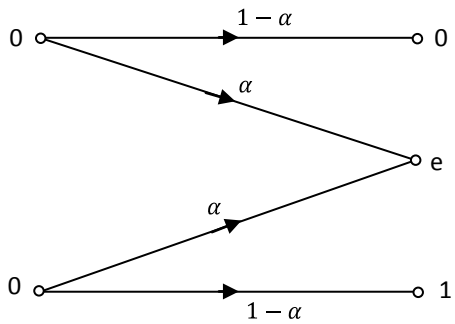
9 (a) Explain the generation of PPM.

(b) Discuss natural and flat topped PAM analytically and compare the same.

UNIT – V

10 (a) State and prove information capacity theorem.

(b) The binary erasure channel has two inputs and three outputs. The inputs are labeled 0 and 1 and the outputs are labeled 0, 1, e. A fraction of incoming bits are erased by the channel. Find the capacity of channel.



OR

11 (a) Give the implication of information capacity theorem in the context of Gaussian channel that is limited in both power and bandwidth through appropriate plot for bandwidth efficiency

(b) A voice grade channel of the telephone network has a bandwidth of 3.4 kHz. Calculate the information capacity of the telephone channel for a signal to noise ratio of 30 dB. Calculate the minimum signal to noise ratio required to support information transmission through the telephone channel at the rate of 9,600 b/s.

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