Code: 13A04404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2019

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) With necessary equation, define transmission efficiency of an AM wave.
(b) Draw the block diagram for the detection of SSB-SC signal using phase discrimination method.
(c) Define sensitivity and selectivity.
(d) Draw the phasor diagram of narrow band FM.
(e) Write down the expressions for WBFM,NBFM and PM.
(f) Define SNR and figure of merit of a communication system.
(g) What are the disadvantages of conventional (or) double side band full carrier?
(h) Define white noise and shot noise.
(i) List the drawbacks of pulse amplitude modulated signal.
(j) Define detection gain and write down the expression for it.

PART – B

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

UNIT – I

2 (a) Explain how the ring modulator for generation of DSB-SC wave act as a demodulator.
(b) An amplitude modulated signal represented in time domain as $4\cos(1800\pi t) + 10\cos(2000\pi t) + 4\cos(2200\pi t)$. Sketch the spectrum and calculate the band width and total power.

OR

3 (a) The output power of AN transmitter is 1 kW when sinusoidally modulated to a depth of 100%. Calculate the power in each side band when the modulation depth is reduced to 50%.
(b) Explain the phase discrimination method for generating SSB.

UNIT – II

4 (a) With necessary equations. Explain the generation of NBFM using narrow band PM generator.
(b) Explain the comparisons between FM and AM techniques.

OR

5 (a) Explain the working of a balanced frequency discriminator with the help of circuit diagram.
(b) What is FM threshold effect? How to achieve threshold reduction in FM system?

UNIT – III

6 (a) Explain the difference between thermal noise and shot noise.
(b) Explain about noise effect in DSB-SC.

OR

7 (a) Explain the noise performance of SSB-SC receiver and prove its S/N ratio is unity.
(b) Prove that the figure of merit of AM system for single tone modulation with 100% modulation is 1/3.

Contd. in page 2

UNIT – IV

8 (a) Explain the methods for demodulation of PAM SIGNALS.

(b) Write the comparisons among PAM, PWM and PPM.

OR

9 (a) With neat sketch, explain the generation of PPM from PWM.

(b) List out the advantages and disadvantages of TRF receiver.

UNIT – V

10 (a) Define the following:

(i) Discrete entropy H(X) and joint entropy H(X,Y).

(ii) Mutual information I(X;Y).

(b) Show that I(X;Y) = H(X) + H(Y) - H(X,Y)

OR

11 (a) State and explain Shannon Hartley theorem.

(b) What is source coding? Define code length & code efficiency. Give the relation between them.

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Code: 13A04404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2017

ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Define modulation.
(b) State the difference between single side band and vestigial side band transmission system.
(c) Differentiate phase and frequency modulation.
(d) What are the applications of phase locked loop?
(e) Define signal to noise ratio.
(f) What is thermal noise?
(g) What is meant by figure of merit of a receiver?
(h) What is the purpose of preemphasis and deemphasis in FM?
(i) Define channel capacity of the discrete memory less channel.
(j) What is entropy?

PART – B

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

UNIT – I

2 Analyze the concepts of AM modulation and derive the equation of an AM wave. Also draw the modulated AM wave for various modulation index.

OR

3 Explain about balanced modulator to generate DSB-SC signal.

UNIT – II

4 Derive the expression for the frequency modulated signal. Explain what is meant by narrowband FM and wideband FM.

OR

5 An angle modulated signal with carrier frequency $\omega_c = 2\pi\ X\ 10^5$ is described by the equation $\varphi_{EM}(t) = 10\cos(\omega_c t + 5\sin 3000\,t + 10\sin 2000\,\pi t)$.

(a) Find the power of the modulated signal.
(b) Find the frequency deviation Δf.
(c) Find the deviation ratio β.
(d) Estimate the bandwidth of $\varphi_{EM}(t)$.

UNIT – III

6 Explain noise in FM and PM systems.

OR

7 Explain the following:

(a) Time domain representation of narrow band noise.
(b) Quadrature representation of narrow band noise.

UNIT – IV

8 Explain pulse position modulation in detail.

OR

9 Write short notes on: (i) Sensitivity. (ii) Selectivity. (iii) Fidelity in radio receiver measurements.

UNIT – V

10 (a) A discrete source emits one of five symbols once every millisecond. The symbol probabilities are $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, and\ \frac{1}{16}$ respectively. Find the source entropy and information rate?

(b) A binary source is emitting an independent sequence of 0's and 1's with probabilities 'p' and '1-p' respectively. Plot the entropy of the source versus 'p' (0<p<1).

OR

11 Discuss source coding theorem, give the advantages and disadvantages of channel coding in detail.

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Code: 15A04402 **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)

*****

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.

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Code: 15A04402

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

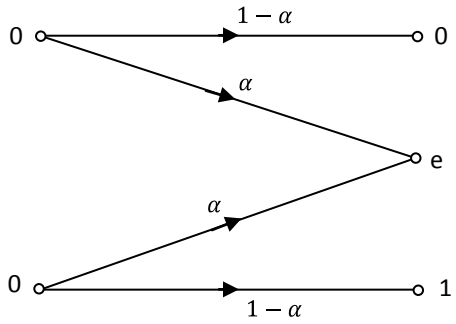
9 (a) Explain the generation of PPM.

(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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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)

*****

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.

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Code: 15A04402

R15

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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Code: 15A04402 **R15**

B.Tech II Year II Semester (R15) Regular & Supplementary Examinations May/June 2019

ANALOG COMMUNICATION SYSTEMS

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) What is the bandwidth for AM wave?
(b) The carrier amplitude after AM varies between 4 volts and 1 volt, calculate depth of modulation.
(c) What are the types of angle modulation?
(d) Define frequency deviation.
(e) Write the expression for PSD of white noise.
(f) Define equivalent noise bandwidth of an ideal band pass system.
(g) What is guard band?
(h) Write the advantages of super heterodyning.
(i) Define the information content of a symbol.
(j) Explain information rate.

PART – B

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

UNIT – I

2 (a) Derive the power relations for single tone amplitude modulation wave.
(b) Explain generations of amplitude modulation using non linear device.

OR

3 (a) Write detailed short note on VSB transmission principle, application with neat frequency spectrum.
(b) Sketch and explain the working of ring modulator to generate a DSB-SC signal.

UNIT – II

4 (a) Explain the Armstrong method for the generation of wideband FM.
(b) State the typical application of narrow band FM.

OR

5 What are the difference between direct method and indirect methods of FM generation? And explain the working of balanced frequency discriminator with help of circuit diagram.

UNIT – III

6 (a) An amplifier operating over the frequency range from 18 to 20 MHz has a 10 kΩ input resistor. Calculate the RMS noise voltage at the input to this amplifier if the ambient temperature is 27℃.
(b) Explain different types of noise.

OR

7 Derive an expression for the overall noise figure of two noisy networks:

$$F = F_1 + \frac{F_2 - 1}{G_1}$$

UNIT – IV

8 State and prove sampling theorem in time domain with neat mathematical approach.

OR

9 Explain the generation of PPM signals. Describe the methods for its detection.

UNIT – V

10 Explain the Shannon's encoding algorithm with example.

OR

11 What is an entropy? Derive an expression for the channel capacity.

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Code: 13A04404

R13

B.Tech II Year II Semester (R13) Supplementary Examinations December 2018

ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Mention the time domain expression for SSBSC wave.

(b) Specify the units of frequency sensitivity k_f.

(c) Write the expression for input SNR of SSBSC receiver.

(d) Denote the local oscillator frequency for given input signal frequency of 70 MHz.

(e) Write the expression for Nyquist interval.

(f) Specify different types of techniques used for SSB generation.

(g) List out various types of FM demodulators.

(h) When two resistors 1 kΩ, 2 kΩ connected in parallel are at 20^0C, what is noise voltage for given bandwidth of 10 kHz.

(i) Define selectivity.

(j) Calculate the Nyquist period for message signal m(t) = 4 cos 8000πt cos 2000πt.

PART – B

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

UNIT – I

2 Describe with block diagram, the basic elements of a communication system.

OR

3 Obtain the:

(a) Total power as well as power of sidebands.

(b) Net modulation index.

(c) Frequency domain representation of given AM signal s(t) = 10 $\cos 2\pi x\, 10^6 t(1 + 2\cos 2\pi x\, 10^3 t + 4\cos 4\pi x 10^3 t)$

UNIT – II

4 Elaborate the concepts of FM generation using direct method.

OR

5 A single tone NBFM signal is given as s(t) = 5 $\cos(4\pi x\, 10^6 t + 0.2\sin 8\pi x\, 10^3 t)$. Obtain the: (i) Message and carrier frequencies. (ii) Frequency deviation. (iii) Band width.

UNIT – III

6 Sketch the block diagram of a super heterodyne receiver and discuss about each block.

OR

7 An AM receiver is receiving 1400 kHz signal. Calculate the: (i) Local oscillator frequency. (ii) Components present at the mixer output. (iii) Image frequency.

UNIT – IV

8 Determine Nyquist rate for the given signal m(t) = 3cos2000 $\pi t = 3\cos 2000\pi t + 7$ in $4000\pi t - 2.5\sin 5000\pi t \sin 8000\pi t$.

OR

9 Justify the statement that a PPM signal can be generated from a PWM signal.

UNIT – V

10 Explain about discrete communication channels.

OR

11 Calculate the total power as well as bandwidth of an FM signal S(t) = 5 $\cos(4\pi x 10^6 t + 4\sin 2500\pi t)$. Also obtain the message and carrier frequencies.

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Code: 13A04404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December/January 2015/2016

ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) Derive the expression for the percentage power saving in AM-SSB-SC with respect to AM-DSB-FC under Tone Modulation.

(b) A periodic symmetric square wave signal of period 2 Sec is defined as:

$$m(t) = \begin{matrix} +1\ for\ 0 \le t < 1\ sec \\ -1\ for\ 1sec \le t < 2sec \end{matrix}$$

It modulates a Carrier $2Cos(2\pi x10^4 t)$ using AM-DSB-FC. Find the side band power of the resulting Modulating signal.

(c) An FM signal $x(t) = 5Cos[2\pi x10^6 t + 5\sin(2\pi x10^3 t)]$ is sent through a circuit whose $output = (input)^2$. Find the bandwidth of the output of the circuit.

(d) Explain why PM is not used for Broadcasting.

(e) Define the power spectral density of: (i) Band limited white noise. (ii) Band pass white noise.

(f) A Two port network with an available gain $g_a(f)$ is driven by a noisy resistor. Find the expression for the available noise power at the output of the network.

(g) Explain why a PWM signal cannot be demodulated directly with an LPF, even though its magnitude spectrum resembles that of PAM signal.

(h) Find the Trigonometric Fourier series coefficient a_n of $s(t) = \sum_k \delta(t - kT_s)$.

(i) A discrete memory less source with entropy 2 bits/message is connected to a communication channel. If the conditional entropy of the source is 1 bit/message, find the rate at which the information is conveyed to the user if the message rate of the source is 500.

(j) Find the capacity of the channel whose noise matrix is a square matrix and having all the elements of the matrix same.

PART – B

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

UNIT – I

2 (a) Derive the expression for the Modulation efficiency of the AM signal $f(t) = A[1 + m.x(t)]cos\omega_c t$, where $'m'$ is the Modulation index and $'x(t)'$ is the base band signal.

(b) Explain the Principle involved in generating AM-DSB-SC signal using Ring modulator.

(c) An AM modulator has an output given by $x(t) = ACos400\pi t + BCos380\pi t + BCos420\pi t$. The un-modulated carrier power is 100 watts and the Transmission efficiency of the AM signal is 40%. Find A and B.

OR

3 (a) Explain the process of Modulation and Demodulation in QAM.

(b) A DSB SC Modulated signal $X(t) = A.m(t).cos2\pi f_c t$ is synchronously demodulated using a local carrier $\cos(2\pi f_c t + \theta)$. Find the maximum value of the ratio between the output power and input power of the Demodulator.

Contd. in page 2

UNIT – II

4 (a) Justify that one form of Angle modulation can be obtained from the other.
(b) Justify that the Angle modulation is a Non-linear modulation method.
(c) An Angle Modulated signal is given by $X(t) = 10Cos[2\pi.10^6t + 5\sin(2\pi.10^3t)]$. Assuming it as PM signal, find the Modulation Index and Band width if: (i) Modulating signal frequency is doubled. (ii) Modulating signal frequency is halved.

OR

5 (a) In an Armstrong Modulator, an NBFM signal with carrier frequency 200 KHz and frequency deviation 25 Hz is passed through a cascade of frequency multiplier 1 (Multiplication factor = 64), a mixer with one of the input as 10.8 MHz, Local Oscillator and another frequency multiplier 2 (Multiplication factor = 48). Find the frequency deviation and the carrier frequency of the signal at the output of the frequency multiplier 2.
(b) Derive Carson's rule for the Bandwidth of an FM signal.

UNIT – III

6 Verify that both AM-DSB-SC and AM-SSB-SC are of same noise performance.

OR

7 (a) Find the Noise bandwidth of an RC low pass filter and the relation with its 3dB bandwidth.
(b) An amplifier operating over the frequency range of 445 KHz to 460 KHz has a 200 Kohms input resistor. What is the r.m.s noise voltage at the input of the amplifier if the ambient temperature is $17℃$?

UNIT – IV

8 (a) Explain about Aperture effect distortion.
(b) Explain the method of converting PPM signal into PWM signal.
(c) A baseband signal m(t) band limited to 10 KHz is sampled using Flat Top sampling. What is the maximum allowed width of the sample so that the signal can be recovered without any distortion?

OR

9 (a) Derive and plot the Magnitude spectrum of PWM signal.
(b) Explain the principle of signal recovery through Holding.

UNIT – V

10 (a) Derive the expression for the capacity of a BSC.
(b) A memory less source has the alphabet $\{-5, -3, -1, 0, 1, 3, 5\}$ with corresponding probabilities $\{0.05, 0.1, 0.1, 0.15, 0.05, 0.25, 0.3\}$. If the source is quantized according to the quantization rule $Q(-5) = Q(-3) = -4$; $Q(-1) = Q(0) = Q(1) = 0$; $Q(3) = Q(5) = 4$, find the entropy of the quantized source.

OR

11 (a) Derive Hartley-Shannon's Law.
(b) An analog signal is band limited to 4 KHz and is sampled at its Nyquist rate. The samples are quantized into 4 levels. Find the information rate of the source if (i) The probability of occurrence of the inner two levels are three times that of the extreme two levels. (ii) All the levels are equally likely.

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Code: 13A04404

R13

B.Tech II Year II Semester (R13) Regular & Supplementary Examinations May/June 2016

ANALOG COMMUNICATION SYSTEMS

(Electronics & Communication Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

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

(a) Justify that AM is a linear modulation system.

(b) A super heterodyne radio receiver with an IF of 460 kHz is tuned to a station operating at 1200 kHz. Determine the associated image frequency.

(c) Draw the phasor diagram of narrowband frequency modulation.

(d) State Carson's rule for determining the bandwidth for an FM wave.

(e) What is white noise? Sketch the PSD.

(f) Define and explain the term 'noise equivalent bandwidth' of a filter.

(g) What is meant by aperture effect? How can it be reduced?

(h) How is PDM wave converted into PPM system?

(i) Differentiate between the terms information and the entropy.

(j) A communication system consists of six messages with probabilities 1/8, 1/8, 1/8, 1/8, 1/4 and 1/4 respectively. Determine the entropy of the system.

PART - B

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

UNIT - I

2 (a) Derive from rudiments the time-domain expression of a single tone AM signal and sketch its spectrum showing the bandwidth requirements.

(b) Explain with sketch the phase discrimination method of SSB generation.

OR

3 (a) Discuss the effect of frequency and phase error in demodulation of DSB-SC wave synchronous detector.

(b) With the help of the block diagram explain the principle of FDM and mention its applications.

UNIT - II

4 (a) Explain fully the difference between frequency and phase modulation, beginning with the definition of each type and the meaning of the modulation index in each case.

(b) An angle modulation signal has the form $V(t) = 100\cos(2\pi f_c t + 4\sin 200\pi t)$, where $f_c = 10\,MHz$. Determine: (i) Average transmitted power. (ii) Peak phase deviation. (iii) Peak frequency deviation. (iv) Is this FM or a PM signal.

OR

5 (a) Explain the working of a ratio detector for FM.

(b) Explain the reactance modulator method of generation of WBFM. Why is it necessary to use AFC in this method of generation?

Contd. in page 2

UNIT - III

6 (a) a $10\ K\Omega$ and a $20\ K\Omega$ resistor are both at room temperature of $27°C$. For a 100 KHz bandwidth, determine the r.m.s value of the thermal noise voltage across (i) Each one of them. (ii) Their series combination. (iii) Their parallel combination.

(b) The available output noise power from an amplifier is 80 nW, the available power gain of the amplifier being 40 dB and the equivalent noise bandwidth being 25 MHz. Calculate the noise figure, assuming T_0 to be $27°C$.

OR

7 (a) Derive an expression for the destination SNR of a DSB-SC system in terms of that of a base band system.

(b) Derive an expression for SNR at the destination for an FM system. Compare this with that of PM system.

UNIT - IV

8 (a) Establish the principles of flat top sampling with neat schematics. Hence explain the phenomenon of aperture effect and equalization.

(b) Show that a PAM signal can be expressed as the convolution of an instantaneously sampled signal, and a rectangular pulse p(t) of the form:

$$p(t) = \begin{cases} 1, & |t| \leq \frac{\tau}{2} \\ 0, & elsewhere \end{cases}$$

OR

9 (a) Explain the generation and demodulation of PDM signals with suitable diagrams.

(b) Explain why a single channel PPM system requires the transmission of synchronization signal, where as a single channel PAM or PDM system does not.

UNIT - V

10 (a) Show that the entropy is maximum when all the symbols of a discrete memoryless source are equiprobable.

(b) State and prove channel capacity theorem.

OR

11 Consider an alphabet of a discrete memory-less source having seven sources symbols with their respective probabilities as given below.

$$[S_k] = [S_0 \quad S_1 \quad S_2 \quad S_3 \quad S_4 \quad S_5 \quad S_6]$$
$$[P_k] = [0.40 \quad 0.20 \quad 0.12 \quad 0.08 \quad 0.08 \quad 0.08 \quad 0.04]$$

Suppose there are 3 numbers of symbols in an encoding alphabet.

(a) Create a Shannon-Fano source code-word for each symbol. Compute the respective length of the code-words for each of the given source symbols.

(b) Determine the average code-word length.

(c) Determine the entropy of the specified discrete memory less source.

(d) Determine the coding efficiency.

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Code: 13A04404

SS

B.Tech III Year II Semester (R13) Regular & Supplementary Examinations May/June 2017

ANALOG COMMUNICATION SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

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

(a) What is the need for modulation?
(b) Define amplitude modulation.
(c) Compare WBFM and NBFM.
(d) Define phase modulation.
(e) What is white noise?
(f) Define noise equivalent bandwidth.
(g) State sampling theorem.
(h) Draw the PPM waveforms.
(i) Define Shannon's channel coding theorem.
(j) Summarize the properties of entropy.

PART – B

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

UNIT – I

2 Explain envelope detector with neat block diagram. Analyze when negative peak clipping takes place in envelope detector.

OR

3 Explain super heterodyne AM receiver with a neat block diagram.

UNIT – II

4 Draw and explain block diagram of Armstrong indirect FM transmitter.

OR

5 Describe the concept of Preemphasis and Deemphasis in FM broadcasting.

UNIT – III

6 Explain noise in DSB and SSB systems.

OR

7 Write short notes on:

(a) Signal to noise ratio.
(b) Probability of error.
(c) Noise equivalent bandwidth.
(d) Noise figure.

UNIT – IV

8 Explain Pulse amplitude modulation in detail.

OR

9 Write short notes on:

(a) Natural and flat top sampling.
(b) Radio receiver measurements.

Contd. in page 2

UNIT – V

10 (a) A source emits an independent sequence of symbols from a alphabet consists of five symbols A, B, C, D and E with symbol probabilities $\frac{1}{4}, \frac{1}{8}, \frac{1}{8}, \frac{3}{16}$ and $\frac{5}{16}$ respectively .Find the entropy of the source.

(b) The output of an information source consists of 128 symbols, 16 of which occur with a probability of 1/32 and the remaining 112 occur with a probability of 1/224. The source emits 1000 symbols/sec. Assuming that the symbols are chosen independently. Find the average information rate of this source.

OR

11 Discuss about:

(a) Rate of information over a discrete channels

(b) Capacity of discrete memory less channels.

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Code: 13A04404 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

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) Define modulation. Why is modulation required in communication system?

(b) Compare TDM and FDM.

(c) The carrier swing of a frequency-modulated signal is 70 KHz and the modulating signal is a 7 KHz sine wave. Determine the modulation index of the FM signal.

(d) What is Threshold effect in FM?

(e) What is meant by thermal noise?

(f) Find the figure of merit when the depth of modulation of AM is:
(i) 100%. (ii) 50%.

(g) State sampling theorem.

(h) Compare the sampling techniques of PAM.

(i) What is meant by Channel Capacity and Channel efficiency?

(j) An event has six possible outcomes with the probabilities P1 = 1/2, P2 = 1/4, P3 = 1/8, P4 = 1/16, P5 = 1/32, P6 = 1/32.Find the entropy of the system and rate of information if there are 16 outcomes per sec.

PART – B

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

UNIT – I

2 Sketch the circuit diagram of balanced modulator and explain how DSB-SC waveform is generated using any two methods.

OR

3 Answer the following:

(a) Quadrature Amplitude modulation.

(b) Phase locked loop (PLL).

(c) Superheterodyne AM Receiver.

UNIT – II

4 Explain the generation of Narrow band Phase Modulation and Narrow band Frequency Modulation with suitable block diagrams.

OR

5 The equation for a FM wave is $s(t) = 10\sin [5.7 \times 10^8 t + 5 \sin 12 \times 10^3 t]$. Calculate: (i) Carrier frequency. (ii) Modulating frequency. (iii) Modulation index. (vi) Frequency deviation. (v) Power dissipated in 100 Ω.

UNIT – III

6 Compare the noise performance of DSB-SC and SSB-SC.

OR

7 Explain the Quadrature representation of narrowband noise along with the envelope of narrowband noise.

UNIT – IV

8 (a) Give comparison of PAM, PWM and PPM.

(b) How to demodulate PPM signal? What are its advantages and disadvantages?

OR

9 List and define the performance parameters of radio receivers in detail.

UNIT – V

10 Discuss Shannon's Encoding algorithm.

OR

11 (a) Explain Entropy and information rate of markoff sources.

(b) Calculate the capacity of a low pass channel with a usable Bandwidth of 3000 Hz and S/N = 10^3 at the channel output. Assume the channel noise to be Gaussian and white.

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