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Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: EC208

Course Name: ANALOG COMMUNICATION ENGINEERING (EC)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any 2 questions.

- 1 a) Write two reasons why modulation is necessary in electronic communication. 5marks
Determine minimum length of antenna required to transmit 1kHz signal.
- b) Define Noise Figure. Calculate the input signal to noise ratio for an amplifier 5marks
with an output signal to ratio of 16 dB and a noise figure of 5.4 dB
- c) A sinusoidal carrier signal of 5V peak amplitude & 100kHz frequency is 5marks
amplitude modulated by a 5kHz signal of peak amplitude 3V. What is the
modulation index & bandwidth.
- 2 a) Write short notes on shot noise, partition noise and white noise. 7marks
- b) Derive Friis's formula 4 marks
- c) Determine noise figure for an equivalent noise temperature of 1000K 4 marks
- 3 a) Define amplitude modulation. Derive the expression for amplitude modulated 7marks
signal. Draw the output waveform and spectrum of amplitude modulated
waveform.
- b) Explain the operation of amplitude modulator circuit using collector 8marks
modulation method.

PART B

Answer any 2 questions.

- 4 a) Define image frequency. 3 marks
- b) For an AM super heterodyne receiver with IF, RF and local oscillator
frequency of 455 kHz, 600 kHz and 1055 kHz respectively. Determine image
frequency and image frequency rejection ratio for a Q of 100. 4 marks
- c) With neat diagrams describe the working of balanced ring modulator. 8marks
- 5 a) With circuit diagram explain the balanced modulator using FETs. 7marks
- b) With a block diagram explain ISB transmitter. State the advantages of SSB & 8marks
ISB systems.
- 6 a) Draw the block schematic of a superheterodyne receiver & explain the working. 7marks

- b) Derive the expression for a frequency modulated signal. State the advantages of FM over AM. 8marks

PART C

Answer any 2 questions.

- 7 a) Explain the Foster Seeley Discriminator method for FM demodulation with the help of neat circuit diagram. 10marks
- b) Explain working of FM transmitter using Armstrong method with a neat block diagram. 10marks
- 8 a) With neat diagram explain transistor modulator circuit for FM. 10marks
- b) Show the equivalence between PM and FM. Explain how FM is obtained from PM. 10marks
- 9 a) Explain the working of varactor diode modulator in FM. 10marks
- b) What is the purpose of dial tone? Briefly discuss about the call initiation procedures. 5 marks
- c) Explain working of a cordless telephone with the help of a block diagram. 5 marks

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, MAY 2019

Course Code: EC208

Course Name: ANALOG COMMUNICATION ENGINEERING (EC)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Explain different types of noises that are generated in an amplifier. (8)
b) Draw the circuit diagram of a diode detector and explain its working. (7)
- 2 a) Two resistors of values $10\text{k}\Omega$ and $20\text{k}\Omega$ in an amplifier are kept at 50°C . The bandwidth of the amplifier is 1 MHz. Find the equivalent thermal noise voltages generated by these resistors when they are connected (a) in series and (b) in parallel. (6)
b) Derive the spectrum for sinusoidally modulated AM wave and also derive the expression for the total average power. (9)
- 3 a) Define noise factor and derive the expression for the output noise power of an amplifier in terms of noise factor. (6)
b) Draw the block diagram of AM transmitter and explain it. (6)
c) The tuned circuit of the oscillator in an AM transmitter employs a $50\mu\text{H}$ coil and a 10nF capacitor. The output of the oscillator is modulated by speech signal frequencies up to 4 kHz, what is the frequency range occupied by the sidebands (3)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) With the help of a block diagram, explain the phase shift method of SSB generation. Derive the expression for the output voltage. (9)
b) Prove that the average power in an FM wave is equal to its un-modulated carrier power. (6)
- 5 a) What are the drawbacks of a tuned radio frequency (TRF) receiver? With the block diagram of a super-heterodyne receiver, explain that they do not suffer from these drawbacks. (10)
b) Calculate the percentage power saving when the carrier and one of the sidebands (5)

are suppressed in an AM wave with modulation index equal to (a) 1 and (b) 0.25.

- 6 a) With the block diagram of transmitter and receiver, explain pilot carrier SSB system. (10)
- b) Make a comparison of AM with FM (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) With the block diagram, explain Armstrong method for FM generation. (10)
- b) Draw the circuit diagram of amplitude limiter and explain its working. (10)
- 8 a) With the help of circuit diagram, explain the working of a varactor diode modulator. (10)
- b) Using expressions, compare FM and PM and show that FM may be generated using PM. (5)
- c) What are the basic functions of a telephone set? (5)
- 9 a) With the help of a circuit diagram, explain the working of a JFET reactance modulator. (10)
- b) Explain the working of a cordless telephone. (10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: EC208

Course Name: ANALOG COMMUNICATION ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks.

Marks

- 1 a) Explain thermal noise in amplifiers. Write down the expression for the noise power and derive the expression for noise voltage. (8)
b) Derive the spectrum for sinusoidally modulated AM wave and draw the spectrum. (7)
- 2 a) A receiver consists of an amplifier which has a noise temperature of 100 K and a gain of 30 dB. The output of the amplifier is connected to a mixer which has a noise figure of 15dB. Calculate the noise temperature of the mixer and the overall noise temperature of the receiver referred to the input. (6)
b) Draw the circuit diagram of a BJT collector modulator for AM and explain its working with waveforms. (9)
- 3 a) Define noise factor and derive the expression for the output noise power of an amplifier in terms of noise factor. (6)
b) The antenna current of an AM transmitter, 30% modulated by a sine wave is 10 A. It increases to 10.75 A while modulated by another sine wave simultaneously. What is the modulation index due to the second wave? (6)
c) Mention the need for modulating a signal before transmission. (3)

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) Derive the expression for the output of a sinusoidally modulated FM wave. Define various parameters in the expression. (8)
b) Explain the operation of a doubly balanced diode ring modulator with the help of a diagram. (7)
- 5 a) A sinusoidal modulating waveform of maximum amplitude 4 V and a frequency of 1 KHz is applied to an FM generator, which has a frequency deviation constant of 5000 Hz/volt. Calculate the maximum frequency deviation, modulation index, and bandwidth. (6)

- b) Explain the working of a balanced modulator using FET. Derive the expression for its output voltage. (9)
- 6 a) What are the drawbacks of a tuned radio frequency (TRF) receiver? With the block diagram of a super-heterodyne receiver, explain that they do not suffer from these drawbacks. (10)
- b) What is companded SSB? (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) With the help of a circuit diagram, explain the working of a JFET reactance modulator. (10)
- b) Explain the concept of pre-emphasis and de-emphasis with the help of circuit diagram, and frequency response curves. (10)
- 8 a) Explain Armstrong method of FM generation. (10)
- b) With necessary curves and circuit diagrams, explain the working of FM slope detector and balanced detector. (10)
- 9 a) With the help of circuit diagram, explain the working of a varactor diode modulator. (10)
- b) What are the basic functions of a telephone set? (5)
- c) Explain the set of procedures for completing a local telephone call. (5)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth semester B.Tech examinations (S), September 2020

Course Code: EC208**Course Name: ANALOG COMMUNICATION ENGINEERING (EC)**

Max. Marks: 100

Duration: 3 Hours

PART A*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) Define the terms signal to noise ratio, noise temperature and noise figure. (6)
b) Draw and explain the working of transistorized, collector modulated AM circuit. (9)
- 2 a) Write short notes on shot noise and thermal noise. What are the methods to reduce the thermal noise? (9)
b) A modulating signal of frequency 5KHz with peak voltage of 6V is used to modulate a carrier frequency of 10MHz with peak voltage of 10V. Determine 1) Modulation index 2) Frequency of LSB and USB 3) Amplitude of LSB and USB 4) Draw the line spectrum. (6)
- 3 a) Calculate the thermal noise power available from any resistor at room temperature 290K for a bandwidth 2MHz. Also calculate the corresponding noise voltage, given that $R=100\Omega$. (6)
b) Explain the power relation between carrier and sidebands in AM for sinusoidal modulation, after deriving the fundamental voltage equation for AM. (9)

PART B*Answer any two full questions, each carries 15 marks.*

- 4 a) Explain the Third method of SSB generation with relevant diagram and appropriate mathematical expression. (8)
b) Prove that the balanced modulator produces an output consisting of sidebands only with the help of a circuit diagram. (7)
- 5 a) Explain with the help of neat sketch the working of super heterodyne receiver. Also how tracking is carried out. (9)
b) An FM wave is represented by the equation $e = 10 \sin(5 \times 10^8 t + 4 \sin 1250t)$. Find (6)
a) Carrier and modulating frequency b) Modulation index and maximum deviation c) Power dissipated by this FM wave in a 5Ω resistor.

- 6 a) With the help of a block diagram, pilot carrier SSB transmitter. Why we use pilot carrier? (8)
- b) Explain the need for AGC. Draw typical AGC circuit for a super heterodyne receiver and explain its working. (7)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) With block diagram explain the FM Stereo broadcasting Transmitter. (10)
- b) Describe with block diagram, operation and basic functions of a standard telephone switch. (10)
- 8 a) Draw the block diagram of an Armstrong indirect FM Transmitter and describe its operation. (10)
- b) With supporting equations and block diagram explain how the PM can be obtained by using FM and vice versa. (10)
- 9 a) Explain how a Foster-Seeley discriminator may be used to detect FM waves, with relevant circuit and phasor diagrams. (10)
- b) What is AFC? Explain its function. (4)
- c) Describe the difference between the operation of a codeless telephone and a standard telephone. (6)
