

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

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

**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) An amplifier operating over the frequency range from 18 to 20 MHz has a  $10\text{ K}\Omega$  input resistor. What is the rms noise voltage at the input to this amplifier if ambient temperature is  $27^\circ\text{C}$ . (5)
- b) Define AM. Draw a neat AM waveform its frequency spectrum for sinusoidal AM. Also derive the expression for AM. (10)
- 2 a) Derive the expression for power, voltage and current in AM. (5)
- b) The antenna current of an AM transmitter is 8Amp when only the carrier is sent, but it increases to 8.93 Amp when the carrier is modulated by a single sine wave. Find the percentage modulation. (5)
- c) Write short note on the following: (5)
- i) Short noise ii) Burst noise
- 3 a) Draw the block diagram of an AM transmitter. Explain the working of each block. (10)
- b) Write at least four reasons for which modulation is needed in an analog communication system. (5)

**PART B**

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

- 4 a) With help of the block diagram explain SSB reception using phasing method and derive the expression for its final output. (7)
- b) Define image frequency and image rejection ratio. (4)
- c) Compare AM and FM with any 4 main points. (4)
- 5 a) With the help of a block diagram, explain the working of pilot carrier SSB transmitter and receiver. (7)
- b) Define FM. Draw a neat FM waveform and derive the expression for FM. (8)
- 6 a) Draw the block diagram of SSB reception using third method (Weaver's method). Derive the expression of its output and explain the working principle. (7)
- b) Draw the block diagram of a superheterodyne receiver and explain the working of each block. (8)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Derive the expression for sinusoidal PM and show the equivalence between FM and PM. (10)
- b) With neat circuit diagram explain the working of a Foster-Seeley discriminator. Also draw the discriminator response ( $V/f$ ). (10)

- 8 a) Draw the block diagram of FM transmitter using indirect method and explain its working. (10)
- b) Describe the working of a varactor diode modulator in FM. (10)
- 9 a) Describe the working of a Transistor modulator in FM. (10)
- b) Draw and explain pre-emphasis and de-emphasis circuits used in FM. (5)
- c) Explain the working principle of DTMF. (5)

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PART A

- Answer any two (2) questions, each carries 15 marks.
- 1) A modulator operating over the frequency range from 18 to 20 MHz has a 10 kHz input message. What is the max noise voltage at the input of this modulator if its noise power is 20 dB?
  - 2) Define AM. Draw a neat AM wave from its frequency spectrum for sinusoidal AM. Also derive the expression for AM.
  - 3) Derive the expression for power voltage and current in AM.
  - 4) The carrier current of an AM transmitter is 8 amp when only the carrier is sent. It is reduced to 8.8 amp when the carrier is modulated by a single sine wave. Find the percentage modulation.
  - 5) Write equations on the following:
    - (a) Signal-to-noise ratio in FM
    - (b) Signal-to-noise ratio in AM
  - 6) Draw the block diagram of an AM transmitter. Explain the working of each block.
  - 7) Write a neat block diagram for which modulation is needed in an analog communication system.

PART B

- Answer any two (2) questions, each carries 15 marks.
- 1) Draw the block diagram of an indirect FM transmitter using the following method and explain the operation of each block.
    - (a) Derive the expression for the frequency of the carrier wave.
    - (b) Derive the expression for the frequency of the modulated wave.
    - (c) Derive the expression for the frequency of the sidebands.
  - 2) Draw a neat block diagram of a varactor diode modulator and explain its working principle.
  - 3) Draw a neat block diagram of a transistor modulator and explain its working principle.
  - 4) Draw the block diagram of a superheterodyne receiver and explain the working of each block.

PART C

- Answer any two (2) questions, each carries 20 marks.
- 1) Derive the expression for the frequency of the carrier wave in an indirect FM transmitter.
  - 2) Derive the expression for the frequency of the modulated wave in an indirect FM transmitter.
  - 3) Derive the expression for the frequency of the sidebands in an indirect FM transmitter.
  - 4) Derive the expression for the frequency of the carrier wave in a varactor diode modulator.
  - 5) Derive the expression for the frequency of the modulated wave in a varactor diode modulator.
  - 6) Derive the expression for the frequency of the sidebands in a varactor diode modulator.
  - 7) Derive the expression for the frequency of the carrier wave in a transistor modulator.
  - 8) Derive the expression for the frequency of the modulated wave in a transistor modulator.
  - 9) Derive the expression for the frequency of the sidebands in a transistor modulator.
  - 10) Derive the expression for the frequency of the carrier wave in a superheterodyne receiver.
  - 11) Derive the expression for the frequency of the modulated wave in a superheterodyne receiver.
  - 12) Derive the expression for the frequency of the sidebands in a superheterodyne receiver.