Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2017

Course Code**: EC 208**

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

Max. Marks:100 Duration: 3 Hours

PART A

Answer any 2 questions. Question No.1 is compulsory.

1. (a) The noise output of a resistor is amplified by a noiseless amplifier having a gain of 60 and a bandwidth of 20kHz, A meter is connected to the output of the amplifier reads 1mV rms (a) The bandwidth of the amplifier is reduced to 5kHz, its gain remaining constant .What does the meter read now? If the resistor is operated at 80^0C, what is its resistance? (8)

   (b)When the percentage modulation is 75, an AM transmitter produces 10kW. How much of this is carrier power? What would be the percentage saving in power if the carrier & one of the sidebands were suppressed before transmission took place? (7)

2. (a) Define Noise Figure & Noise factor. Derive the expression for overall Noise Factor (F) of cascaded amplifiers. (8)

   (b) Why modulation used in analog communication? What are the sources of noise that affect the communication quality? (7)

3. (a) Derive the equation for AM wave. Plot the frequency spectrum of AM if the carrier is of maximum amplitude 5V, 100 kHz is simultaneously modulated by three modulating signals of amplitude 2V, 5kHz; 1.5V, 2kHz & 1V, 1kHz respectively. Obtain the bandwidth &effective modulation index. (8)

   (b)With neat diagram explain working of envelope detector. The output of a diode envelope detector with a load resistance of 5 kΩ, is fed through a dc blocking capacitor to an amplifying stage which has an input resistance of 10kΩ. Determine the maximum depth of modulation the detector can handle without negative peak clipping? What is the other error associated with envelope detector? How it can be avoided? (7)

PART B

Answer any 2 questions. Question No.4 is compulsory.

4. (a) Prove that balanced modulator suppresses the carrier. (7)

   (b) An AM radio uses a superhetrodyne receiver. The mixer translates the carrier frequency f_c to a fixed IF of 455 kHz by using a local oscillator of frequency f_{LO}. The broadcast-band frequencies range from 555 kHz to 1605 kHz. (a) Determine the range of frequency tuning and capacitor tuning that must be provided in the local oscillator (i) when f_{LO} is higher than f_c (and (ii) when f_{LO} is lower than f_c. Based on the results obtained in (a), explain why the usual AM radio receiver uses f_{LO} higher than f_c. (8)

5. (a) With a neat diagram explain the Weaver's method for SSB generation. State the advantages and disadvantages of this method (10)

   (b) What is ISB? Compare SSB and ISB. (5)

6. (a) With neat block diagrams, compare single versus double conversion super heterodyne receivers. (8)

   (b) If the signal v(t)= 20 sin(2π x 10^6t + 10 sin2π x 10^3t) represents a FM signal, determine i)The carrier frequency ii) The modulating frequency iii) The modulation index, iv) band width required, v) average power if the load resistance is 50Ω. Also write the expression for FM signals if the modulating frequency is doubled. (7)

PART C

Answer any 2 questions. Question No.7 is compulsory.

7. Describe the working of a Varactor Diode FM Modulator and balanced slope detector. (20)

8. (a) With a neat block diagram explain FM transmitter using indirect method. (10)

   (b) Given FM and PM modulators with the following parameters: Deviation sensitivity as 1.2 kHz/v & 1.2rad/volt respectively. Carrier: 20 cos(2π x 500x10^3t) ; Modulating signal: 5cos (2π x 10^3t) (i) Determine the modulation indices, bandwidth and sketch the output spectrum for both modulators. (ii) Half the modulating frequency and Determine the modulation indices and sketch the output spectrum for both modulators. Assume random value for the Bessel coefficients (10)

9. (a) Why pre-emphasis and de-emphasis are used in FM? Draw the circuit diagrams and the characteristics of pre-emphasis and de-emphasis circuits. (10)

   (b) Describe functional block diagram of a standard telephone set. (10)

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