MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : EC-501

ANALOG COMMUNICATION

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) In case of envelope detector for proper detection of the envelope

   a) Discharging time constant RC less than $1/f_c$

   b) Discharging time constant RC greater than $1/f_c$

   c) Discharging time constant RC equals to $1/f_c$

   d) None of these.

ii) Vestigial sideband modulation is generally used for

a) Point-to-point communications

b) Telemetering

c) TV Broadcasting

d) Stereo broadcasting.

iii) PLL can be used to demodulate

a) PAM signal b) PCM signal

c) FM signal d) DSB-SC signal.

iv) Sensitivity of radio receiver is defined by

a) Ability *y* to receive very weak signal

b) Ability to reject unwanted signal

c) Ability to maintain constant gain

d) None of these.

v) Commercial FM has

a) 200 kHz channel bandwidth and 75 kHz deviation

b) 150 kHz channel bandwidth and 55 kHz deviation

c) 15 kHz channel bandwidth and 75 kHz deviation

d) None of these.

vi) What is the maximum transmission efficiency of AM signal ?

a) 67% b) 50%

c) 33.3% d) 100%.

vii) The maximum power for generalized AM wave under distortionless condition is

a) $1.5\ P_c$ b) P_c

c) $2\ P_c/3$ d) $P_c/3$.

viii) Selectivity of a receiver is

a) change with incoming signal frequency

b) poorer at higher frequencies

c) the rejection of the adjacent channel at the receiver

d) All of these.

ix) A specific AM broadcasting ratio transmitter radiates 10 kW when the depth of modulation is 60%. The carrier power required is

a) 9 kW b) 7.8 kW

c) 8.47 kW d) 9.5 kW.

x) Modulation efficiency for AM in case of 100% modulation is

a) 13% b) 23%

c) 33% d) 43%.

xi) VSB is used in

a) TV transmission b) satellite system

c) broadband system d) none of these.

xii) Which one has the highest bandwidth ?

a) DSB b) SSB

c) VSB d) DSB-SC.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Why do we transmit a pilot carrier with the transmitted FM stereo signal ? Draw and explain the reactance modulator method of Frequency modulation. 1 + 4

3. What is coherent detection ? Explain Quadrature Null Effect.

4. What do mean by AWGN ? Give significance of each of these letters.

5. Determine the frequency deviation Δf and carrier swing for an FM signal which has a carrier frequency of 100 MHz and whose upper frequency is 100.007 MHz when modulated by a particular modulating signal or wave. Also find the lowest frequency reached by the FM wave.

6. The antenna current of an AM transmitter is 8 Amp 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. Determine the antenna current when the percentage of modulation changes to 0.8.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Explain the working principle of envelope detector.

   b) The modulation index of AM is greater than unity, what problems will be encountered during demodulation ?

   c) A complex modulating waveform consisting of a sine wave of amplitude 3V and a frequency 1 kHz plus a cosine wave of amplitude 5V and frequency 3 kHz amplitude modulates 500 kHz and 10V peak currier voltage. Plot the spectrum of modulated wave and determine the average power when the modulated wave is fed into 50Ω load. 5 + 3 + 7

8. a) Draw the block diagram of a simple super heterodyne receiver and explain its working principle.

   b) What is image frequency in supprt heterodyne receiver ?

   c) What are sensitivity and selectivity of a ratio receiver ? 8 + 3 + 4

9. a) Define DSB-SC and SSB-SC.

   b) With neat block diagram explain the principle of SSB-SC generation by phase shift method.

   c) A modulating signal given by $v_m = 2 \sin (2\pi \times 500t)$ amplitude modulates a carrier given by $v_c = 10 \sin (2\pi \times 106t)$. Determine

      i) Modulation index

      ii) Frequency present in the modulated signal

      iii) Total transmitted power. 4 + 5 + 6

10. a) Explain with suitable block diagram the generation of FM signal using Armstrong method.

    b) What is the difference between NBFM and WBFM ?

    c) Discuss about the role of pre-emphasis and de-emphasis circuit in FM broadcasting. 8 + 3 + 4

11. Write short notes on any *three* of the following : 3 × 5

a) Diagonal Clipping

b) Reactance Modulator for FM

c) Shot Noise

d) Frequency Mixer

e) Stereophonic FM Broadcasting.