Total No. of printed pages = 4

ECE 181403

5/3/23

Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 4th Semester End-Term Examination

ECE

ANALOG COMMUNICATION

New Regulation (w.e.f. 2017-18) & New Syllabus (w.e.f. 2018-19)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* from the rest.

1. Choose the correct answer : (10 × 1 = 10)

(i) Which of the following is a Primary Communication Resource?

(a) Noise (b) Channel Bandwidth

(c) Transmission lines (d) Receiver

(ii) Carson's rule is used to calculate

(a) Bandwidth of FM signal (b) Bandwidth of SSB signal

(c) Modulation index (d) Noise figure

(iii) The minimum antenna height required for transmission in reference to wavelength λ is

(a) λ (b) $\lambda/4$

(c) $\lambda/2$ (d) 4λ

(iv) In TV transmission, picture signal is ———— modulated

(a) DSB-SC (b) VSB

(c) SSB-SC (d) PAM

[Turn over

(v) The selectivity of most receivers is determined largely by ————————

(a) Sensitivity (b) Characteristics of IF section

(c) Antenna direction (d) All of the above

(vi) What is the value of carrier frequency in the following equation for the FM signal?

$v(t) = 5 \cos (6600t + 12 \sin 2500t)$

(a) 1150 Hz (b) 6600 Hz

(c) 2500 Hz (d) 1050 Hz

(vii) The modulation technique that uses the minimum channel bandwidth and transmitted power is

(a) FM (b) DSB-SC

(c) VSB (d) SSB

(viii) What is the carrier frequency in an AM wave when its highest frequency component is 850Hz and the bandwidth of the signal is 50 Hz?

(a) 800 Hz (b) 695 Hz

(c) 900Hz (d) 825 Hz

(ix) FM signal is better than AM signal because

(a) Less immune to noise

(b) Less adjacent channel interference

(c) Amplitude limiters are used to avoid amplitude variations

(d) All of the above

(x) The noise due to random behaviour of charge carriers is ————————

(a) Shot noise (b) Partition noise

(c) Industrial noise (d) Flicker noise

2. (a) An AM wave is given by 10

$s(t) = 10 (1 + 05 \cos 2000 \pi t + 0.5 \cos 4000 \pi t) \cos 20000 \pi t$

(i) Sketch the spectrum of $s(t)$

(ii) Find the carrier power

(iii) Find the average power content of each spectral component including the carrier

(iv) Find the total power and power efficiency.

(v) What is the overall effective modulation index?

(b) Explain the working of Costas receiver for demodulation of DSBSC signal. 5

3. (a) An antenna transmits a 10kW power at 95% modulation using conventional AM. Evaluate the amount of power saving if SSB-SC transmission is used for the same intelligibility. 5

(b) An FM wave is given by $s(t)=20\cos\left(8\pi\times10^{6}t+9\sin 2\pi\times10^{3}t\right)$. 6

Calculate

(i) Frequency Deviation

(ii) Bandwidth

(iii) Power of FM wave.

(c) Consider the angle modulated signal 4

$x_c(t)=10\cos\left[2\pi(10^{6})\,t+0.1\sin\left(10^{3}\right)\pi t\right]$

Determine $m(t)$ considering

(i) $x_c(t)$ as a PM signal with $K_p=10$

(ii) $x_c(t)$ as a PM signal with $K_f=10\pi$.

4. (a) Draw and explain the super heterodyne AM receiver. 7

(b) An AM receiver in medium wave with IF 455 kHz is tuned to station at 790 kHz. Assume tuned circuit quality factor of 40. Find image frequency and calculate image rejection ratio. 5

(c) With necessary diagram explain clearly under what circumstances a signal is said to be in under modulation, over modulation and critically modulation condition. 3

5. (a) What is pulse modulation? Explain briefly various types of pulse modulation with relevant waveforms. 10

(b) Explain the terms TDM and FDM. Compare their relative merits and demerits. 5

6. (a) Explain the Armstrong method for FM generation. 6

(b) Define Noise temperature, Noise factor and Figure of merit. Derive the expression of output SNR for a DSB-FC receiver. 3+6

7. Write short notes on (any *three*) : 3×5=15

(a) TRC receiver

(b) VSB modulation

(c) Pre emphasis Vs. De emphasis

(d) Thermal noise

(e) Square law detector.