CBCS SCHEME

USN | | | | | | | | | |

15EC45

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Principles of Communication System

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define amplitude modulation. Derive the mathematical expressions for standard AM wave both in time and frequency domain considering the message signal to be single tone along with necessary figures. **(08 Marks)**

b. Briefly explain SSBSC modulation technique. Mention the requirements of a bandpass filter used in the SSBSC transmitter system. **(05 Marks)**

c. For an amplitude modulated wave, consider a message signal $m(t) = 20\cos(2\pi t)V$ and the carrier wave $c(t) = 50\cos(100\pi t)$ V

i) Write an expression for the resulting AM wave for 75% modulation.

ii) Draw the spectrum of an AM wave. **(03 Marks)**

OR

2 a. With a neat block diagram and necessary figures explain the frequency translation technique. **(08 Marks)**

b. Write short note on quadrature carrier multiplexing systems. **(05 Marks)**

c. The total power content of an AM wave is 1000W. Determine the power being transmitted at the carrier frequency and at each of the sidebands when the percent modulation is 100%. **(03 Marks)**

Module-2

3 a. Obtain an expression for FM wave considering modulating signal to be a single tone. **(06 Marks)**

b. Explain the method of generating WBFM wave using narrow band FM wave with necessary block diagram. **(07 Marks)**

c. The carrier swing of a frequency modulated signal is 70kHz and the modulating signal is a 7kHz sine wave. Determine the modulation index of the FM signal. **(03 Marks)**

OR

4 a. With a neat block diagram explain FM stereo multiplexing. **(08 Marks)**

b. With a neat circuit diagram explain superheterodyne receiver. **(08 Marks)**

Module-3

5 a. Define mean, correlation and covariance functions. **(06 Marks)**

b. Define autocorrelation function. Mention the properties of the auto correlation function. **(06 Marks)**

c. Write short notes on noise equivalent bandwidth. **(04 Marks)**

OR

6 a. Explain short noise, thermal noise. **(06 Marks)**

b. Discuss in detail white noise. **(05 Marks)**

c. Derive the relation between noise figure and equivalent noise temperature. **(05 Marks)**

Module-4

7 a. Discuss the noise effects in DSB-SC receiver with a receiver model. Prove that figure of merit for such a receiver is unity. **(10 Marks)**

b. An AM receiver operating with a sinusoidal modulating signal has $\mu = 0.8$ and $[SNR]_0 = 30dB$. What is the corresponding carrier – to – noise ratio? **(06 Marks)**

OR

8 a. Explain threshold effect in FM. Also explain how it is minimized. **(06 Marks)**

b. Show that figure of merit of FM receivers gets reduced to $1.5\beta^2$ for single tone modulating signal. **(10 Marks)**

Module-5

9 a. Mention the advantages of digital communication when compared to analog communication. **(06 Marks)**

b. State sampling theorem. Show that the process of uniformly sampling a signal in time domain results in a periodic spectrum in the frequency domain with a period equal to the sampling rate f_s. Explain over sampling, under sampling and perfect sampling. **(10 Marks)**

OR

10 a. With a suitable block diagram explain functioning of PCM systems. **(10 Marks)**

b. With a neat block diagram, explain the generation of PPM waves. **(06 Marks)**

* * * * *