

Communication Theory

Spring-2024

Exam: Mid Sem

Marks: 50

Date: 27 Feb 2024

Time: 11:00 am to 12:30 pm

Instructions:

- Answering all questions is compulsory.
- Calculator use is allowed.
- Clearly state the assumptions (if any) made that are not specified in the questions.

1. Answer any three of the following questions.

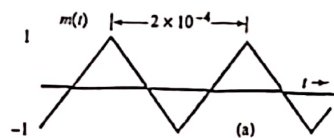
[10×3=30]

- (a) Present the bandwidth analysis of WBFM signal with detailed arguments.
- (b) Explain the envelop detector for AM signal.
- (c) Explain what is uniform quantization and derive its SNR.
- (d) What is power spectral density and show that it is Fourier transform of auto-correlation function for a random single.

2. Answer the following questions in short.

[4×5=20]

- (a) Provide a comparison table for DSB-SC, AM, SSB, QAM, NBFM and WBFM modulations schemes.
- (b) Determine the transmission bandwidth required for non-uniform quantization based PCM signal when the desired level of SNR is equal to 30 dB, message signal bandwidth is equal to 4 KHz and $\mu = 100$.
- (c) Discuss the reconstruction of a signal sampled at Nyquist rate using sinc-interpolation.
- (d) Determine the bandwidth and frequency deviation of FM signal for the modulating signal $m(t)$ shown in the following figure. Assume that $K_f = 2\pi \times 10^5$ and the signal bandwidth is $B = 15$ KHz. Also, draw FM signal for this modulating signal.



- (e) Determine the power spectral density of the output of an ideal LPF with bandwidth B for a random input signal having auto-correlation function $R(\tau) = \delta(\tau)$.