

## Communication Theory Spring 2024

Exam: Quiz 2  
Total Marks: 25

Date: 01 April 2024  
Time: 11:45 am to 12:30 pm

Instructions:

- All questions are compulsory.
- Clearly state the assumptions (if any) made that are not specified in the question.

1. For binary detection of pulse  $\pm p(t)$  under AWGN noise, show that optimal receiver filter is [5]

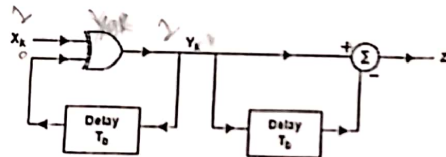
$$h(t) = p(T_0 - t).$$

2. Explain  $M$ -ary FSK scheme and determine its minimum transmission bandwidth? [6]

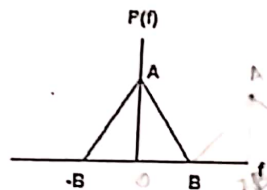
3. Determine the PSD of the following line coding scheme [6]

$$m(t) = \sum_k z_k p(t - kT_b),$$

where  $p(t)$  is a rectangular pulse of duration  $T_b$  and sequence  $z_k$  is generated using following logic circuit.



4. The Fourier transform of  $p(t)$  is shown in the following figure. Consider the pulse  $p(t)$  is employed for binary communication system and answer the following questions. [8]



1. Determine the pulse rate that satisfies the Nyquist's zero ISI criterion using  $P(f)$ .
2. Find  $p(t)$  and verify whether it satisfy the Nyquist's criterion.
3. If  $p(t)$  satisfy the Nyquist's criterion, then determine the transmission rate  $R_b$  and the roll-off factor  $\alpha$ .

ALL THE BEST!

$x_k$	0	1	1	1	0	1
$y_k$	0	1	0	1	1	0
$z_k$						