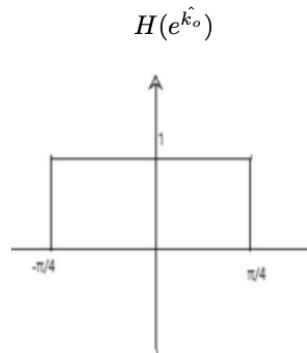# DSA-Assignment-4

Deadline: 23rd April 2024

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1. Solve all the question and submit a handwritten document
2. Plagiarism will be penalised
3. Submit a pdf of the form **<roll_no>_dsa4.pdf**

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1 FIR Filter Design - 20 marks

1. **(10 marks)** Design the below filter using:

$$H(e^{\hat{k}_o})$$

(a) without window
(b) with Hamming window

2. **(10 marks)** A popular method for designing FIR filters is windowing. Start with an ideal filter $H_D(\Omega)$ (e.g., LPF) whose impulse response $h_d[n]$ is an IIR filter. Then design the desired FIR filter $h[n] = w[n]h_d[n]$, where w is a window function.

Assume H_d to be a LPF and a rectangular window:

$$w[n] = \begin{cases} 1 & \text{if } n = 0, 1, 2 \\ 0 & \text{otherwise} \end{cases}$$

1. Find the effect of windowing (in the time domain) on the frequency response $H(\Omega)$ by deriving and plotting it.

2. Establish the relationship between the window length $L = 3$, resulting filter length M

2 Speech Production - 5 marks

3. **(5 mark)** Record your name in Wavesurfer software and observe different sounds. Submit spectrogram, formants, and other plot figures obtained using Wavesurfer.