EE 200: Quiz 4
Duration 60 Minutes

Use the following format of answering:

Name: **Roll No:** **Section:**

Email: **WhatsApp no:**

*Write **only** the final answer in each question. There are total 5 questions and all questions carry equal marks. Answer scripts submitted after 60 minutes will be penalized with negative marks. The submission channel will be closed at completion of 60 minutes.*
*Note: In case you are submitting via email due to any reason, send your answer file **only** to the **TA's** of your section. **Please do not send it to the tutor.***

1. Determine the DTFT of the sequence

$$g[n] = -\alpha^n \mu[-n-1],\ |\alpha| < 1.$$

2. Let $G(e^{j\omega})$ denote the DTFT of the sequence $g[n]$. Determine the inverse DTFT $h[n]$ of the DTFT

$$H(e^{j\omega}) = \frac{1}{2}[G(e^{j\omega/2}) + G(-e^{j\omega/2})]$$

   in terms of $g[n]$.

3. Which one of the following functions of ω can represent the DTFT of a digital signal? Justify your answer.
   (a) $2\sin(0.4\omega) + 3\cos(2\omega)$
   (b) $2\cos(2\omega) + 3\sin(4\omega)$

4. Derive the impulse response $h_{DIF}[n]$ of the ideal differentiator given by

$$H_{DIF}(e^{j\omega}) = j\omega.$$

5. Let $H_{LP}(z)$ denote the transfer function of an ideal low pass digital filter with a cutoff frequency at w_c. Show that $G(z) = H_{LP}(-z)$ is an ideal high pass digital filter. Determine the cutoff frequency of $G(z)$ in terms of w_c. Express the impulse response $g_{HP}[n]$ of the high pass filter $G(z)$ in terms of the impulse response $h_{LP}[n]$ of the low pass filter $H_{LP}(z)$.