## Problem 7.3

To determine the forward or inverse DTFT:
(a)

$$
V_{1}\left(e^{j \hat{\omega}}\right)= \begin{cases}1 & |\hat{\omega}| \leq 0.3 \pi  \tag{1}\\ 0 & 0.3 \pi<|\hat{\omega}| \leq \pi\end{cases}
$$

The IDFT needs to be computed.Using the table of DTFT pairs, it is given by:
$v_{1}[n]=\frac{\sin (0.3 \pi n)}{\pi n}$.
(b)

$$
v_{2}[n]= \begin{cases}0 & n<0  \tag{2}\\ 1 & n=0,1,2, . .9 \\ 0 & n>9\end{cases}
$$

The DTFT needs to be computed. It is given by:
$V_{2}\left(e^{j \hat{\omega}}\right)=\sum_{n=0}^{9} e^{-j \omega \hat{\omega}}=\frac{\sin (5 \hat{\omega})}{\sin (\hat{\omega} / 2)} e^{-j \hat{\omega} 4.5}$.
(c)

$$
V_{3}\left(e^{j \hat{\omega}}\right)= \begin{cases}0 & |\hat{\omega}| \leq 0.3 \pi  \tag{3}\\ 1 & 0.3 \pi<|\hat{\omega}| \leq \pi\end{cases}
$$

The IDFT must be computed.
Additionally, it is seen that $V_{3}\left(e^{j \hat{\omega}}\right)$ can be related to $V_{1}\left(e^{j \hat{\omega}}\right)$
as $V_{3}\left(e^{j \hat{\omega}}\right)=1-V_{1}\left(e^{j \hat{\omega}}\right)$.
Then, $v_{3}[n]=\delta[n]-v_{1}[n]$, where $v_{1}[n]=\frac{\sin (0.3 \pi n)}{\pi n}$.
(d)

$$
v_{4}[n]= \begin{cases}0 & n<0  \tag{4}\\ (-1)^{n} & n=0,1,2, . .9 \\ 0 & n>9\end{cases}
$$

The DTFT must be computed. This is given by:
$V_{4}\left(e^{j \hat{\omega}}\right)=\sum_{n=0}^{9}(-1)^{n} e^{-j \omega \hat{}}=e^{j \pi n} e^{-j \hat{\omega n}}=\frac{\sin (5(\hat{\omega}-\pi))}{\sin (\hat{\omega}-\pi) / 2} e^{-j(\hat{\omega}-\pi) 4.5}$.

