You need to know the following topics in Ch 7 and 9 for the DSP Final

1- Given a discrete signal $x[n]$ you should be able to find its z-Transform $X(z)$ using the definition (the summation).

2- Given the X(z), you should be able to find $x[n]$ using the partial fraction expansion and the table.

3- You should be able to use the z-Transform properties and tables to find the z-Transform and the inverse z-Transform of a signal.

4- Given the difference equation of a system you should be able to find the transfer function $H(z)$.

5- Given the difference equation of a system and the initial conditions, you should be able to find the zero-input response $y_{zi}[n]$ using the z-domain analysis.

6- Given the difference equation of a system and the input $x[n]$, you should be able to find the zero-state response $y_{zs}[n]$ using the z-domain analysis.

7- Given the system transfer function $H(z)$ and the input $x[n]$, you should be able to find the zero-state response $y_{zs}[n]$ using the z-domain analysis.

8- Given $H(z)$ of a system you should be able to find the system's frequency response $H(\Omega)$.

9- Given H(z) and the special everlasting inputs $A\cos(\Omega_o n)$ or the exponential $\left(Ae^{j\Omega_o}\right)^n$, you should be able to find the system output (zero-state response).

10- Given the $H(z)$ you should be able to draw the bock diagram of the Direct Form II and Transpose realizations.

11- Given $H(z)$ you should be able to determine the zeros and poles of the system and determine the stability of the system.

12- Given the block diagram of the system, you should be able to derive the transfer function $H(z)$ and the difference equation of the system.

13- Given $H(z)$ or a plot of the poles and zeros in the z-plane, you should be able to plot a rough magnitude response $|H(\Omega)|$ vs. frequency Ω.

14- You should be able to apply the poles-zeros placement technique to design a system (finding $H(z)$) that meets given criteria.

15- Given $x[n]$ you should be able to find the DFT $X[k]$.

16- Given $X[k]$, you should be able to find $x[n]$.

17- You should be able to use the zero-padding technique to enhance the frequency resolution Ω_0 of the DFT $X[k]$.

18- Given $x[n]$ and $h[n]$ you should be able to find $y[n]$ using circular convolution or finding first $Y[k]$ and then $y[n]$ using the IDFT.

19- Given $X[k]$ and the sampling rate, you should be able to determine the fundamental frequency and the harmonics of $X[k]$ in rad/samples and in Hz.

20- Given input $x[n]$ of size $N_x = 6$ and the system impulse response $h[n]$ of size $N_h = 2$. You should be able to find the output $y[n]$ by using block convolution of size $N = 3$.