

Observations:

Zeros

1. The zeros in the pole zero plot are due to the zeros in the transfer functions of the differentiator ($z=1$) and averaging filter. ($z=1$ alongwith others)
2. The notch filter causes conjugate zeros at $+0.24$ and -0.24
3. The value of the output will go to zero at these zero points. Thus the notch filter ensures that response is zero for a frequency of 60 Hz.

Poles

1. The conjugate poles are due to the LPF and HPF. Since the response at these point is infinite, the ROC is outside the outermost pole and input doesn't take the pole values.
2. The number of poles = Order of the filter =6.
3. There are some poles at zero. These must be cancelled by zeros so that it doesn't affect the response.
4. The output become unstable for the poles at $z=1$ as these are on the right side of the real axis. Hence these values must not be reached.

Magnitude Response

1. Magnitude response clearly shows that frequencies below 0.5Hz (action of HPF) and those above 70Hz (action of LPF) are rejected, although not completely. The response decreases outside this range.
2. Response also dips at a frequency of 60Hz- Action of Notch filter.

NO OF BEATS-24

This is obtained by counting all values above a threshold of 0.01. (and rejecting noise due to pulses right after each other)

HEART RATE-72 beats/min

Since 24 beats occur in the entire time interval, the number of beats in 1 minute is obtained by taking the sampling period as $2*100\text{Hz}$ - Nyquist frequency. (as it's given that highest frequency component is 100Hz).