Design of Filters using Pole Zero Placement

Problem sheet

1. The pole zero plots in Figure Q3 describe six different causal digital filters (A to F). Answer the following questions about these filters:
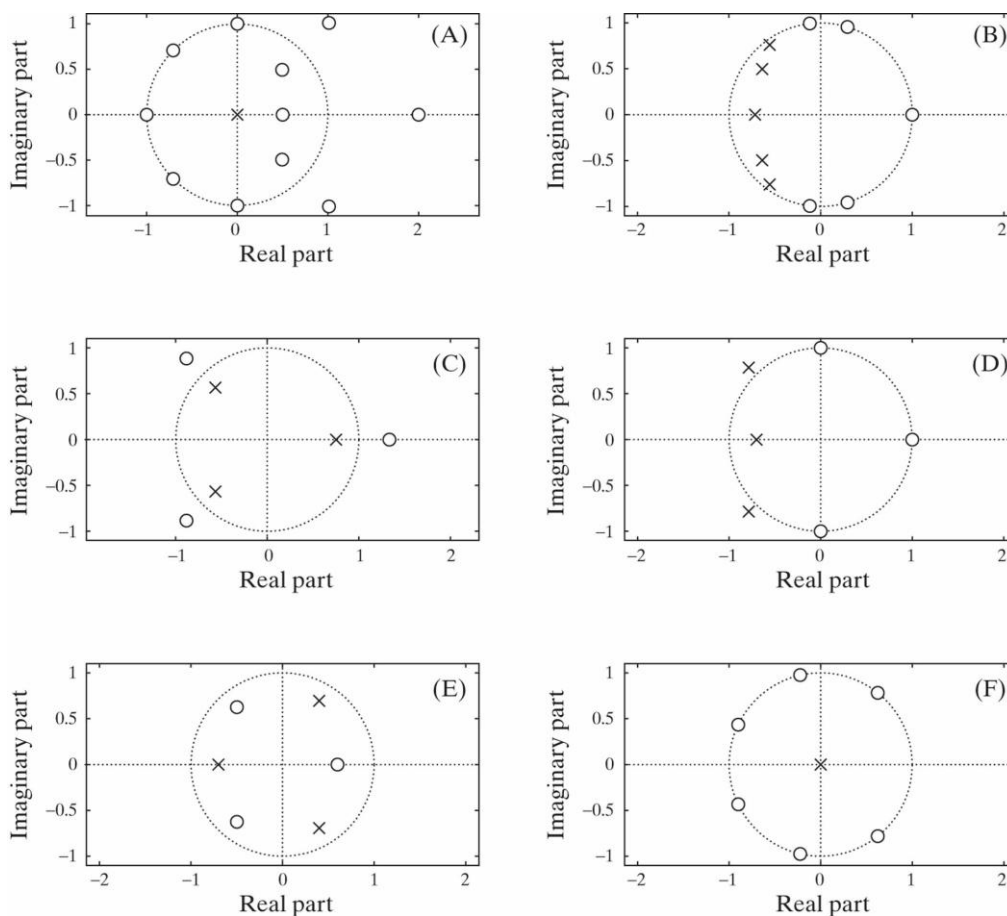
(a)	Which filters are Infinite Impulse Response (IIR) Filters? Explain why.
(b)	Which filters are Finite Impulse Response (FIR) filters? Explain why.
(c)	Which filters are stable? Explain why.
(d)	Which filter has the shortest impulse response? Explain why.
(e)	Which two filters are clearly NOT low pass filters and why?

2. Design a suitable IIR digital filter for removing narrow-band interference at 50Hz from a signal sampled at 500Hz. For your design:

   a) Give the transfer function.

   b) Sketch the pole zero diagram.

   c) Sketch the magnitude of the frequency response in the range $0 \leq \Omega < 2\pi$.