①

Answer:

Q2a) X(k)   =   {7, -0.707-j0.707, -j, 0.707-j0.707, 1, 0.707+j0.707, j, -0.707+j0.707}

Q2 b)   y(n) = {8, -2, -1, -4, -1}

Q3 a)   order of the filter N = 4

Normalized T.F.

$H(s_n) = 1/(s^4 + 2.6132\ s^3 + 3.143\ s^2 + 2.6132\ s + 1)$

Unnormalized T. F. of the Butterworth filter.

$H(s) = 0.3578/(s^4 + 2.021\ s^3 + 2.0423\ s^2 + 1.2089\ s + 0.3578)$

Q3 b)   T.F. is $Y(z) = X(z) + 0.368\ y(n-1)$

Q5 a) $H(z) = -0.0081\ [1+z^{-6}] + 0.0469\ [z^{-1}+z^{-5}] - 0.1141\ [z^{-2}+z^{-4}] + 0.2\ z^{-3}$