## Problem 6 (FFT)

Let $v(n)$ be a time-discrete signal

$$v(n) = [v(0), v(1), v(2), v(3), v(4), v(5), v(6), v(7)].$$

(a) Separate the signal $v(n)$ into even and odd time-indices $v_1(n)$ and $v_2(n)$ respectively and find the DFT expression for each separated sequence.

(b) Now compute the DFT of $v(n)$ using the above expressions.

(c) Sketch the signal flow diagrams when DFT is directly applied to $v(n)$ and as shown in part (b). Show the reduction in complexity by computing the number of complex multiplications for each method.

(d) Can the complexity be reduced further? If yes then find the final expression.

(e) Sketch the complete signal flow for part (d).