

**Problem 7 (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).