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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER M.TECH DEGREE EXAMINATION, MAY 2016

Electronics and Communication Engineering

(Signal Processing)

01EC6306 Multirate Systems and Wavelets

Max. Marks: 60 Duration: 3 Hours.

Answer any two questions from each PART

PART A

1. (a) Obtain the polyphase structure of the filter with Transfer function $H(Z) = (1-2Z^{-1}) / (1+3Z^{-1})$.
   (b) Determine the output sequence y(n) with sampling rate conversion with a rational factor ¾, for the input sequence x(n)=[5,3,7,1,2,6,4,9,2]

   (9 Marks)

2. (a) Explain two channel quadrature mirror filter bank (QMF) and obtain the condition for alias free response.
   (b) For the QMF bank, $H_0(Z) = (1+Z^{-1})$. Find the transfer functions of synthesis filters $G_0(Z)$ and $G_1(Z)$ for perfect reconstruction.

   (9 Marks)

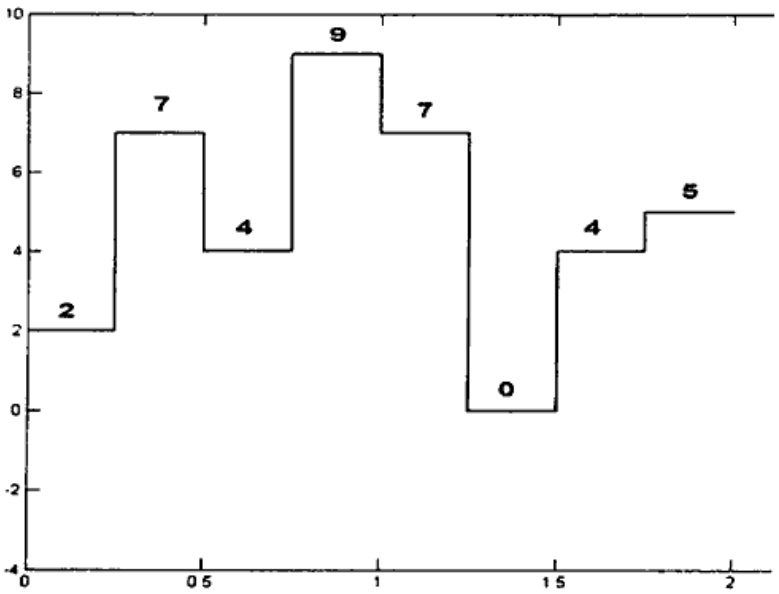
3. (a) Explain upsampler with time domain representation and derive the equation for the output spectrum. How the problem created by the upsampler is overcome?
   (b) Obtain the polyphase efficient realization of two channel uniform DFT filter bank for Analysis filter bank and Synthesis filter bank.

   (9 Marks)

PART B

4. Represent the given waveform in signal space V2 in terms of signal space V1, W0 and W1.

   (9 Marks)



5. Explain the Time-Frequency localization capability of Wavelets with a proper example (9 Marks).

6. Prove that DWT is equivalent to a normal convolution followed by decimation. (9 Marks)

PART C

7. Explain the biorthogonal wavelet analysis phase and synthesis phase. (12 Marks)
8. Explain the construction of biorthogonal wavelet construction using B-splines. (12 Marks)

9. Explain lifting scheme for splitting a signal into sub-bands and inverse lifting for re-construction. What are its advantages over classical method? (12 Marks)