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Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, February 2015
(2013 Scheme)
Electronics and Communication
Streams : Applied Electronics and Instrumentation, Microwave and TV Engineering, Telecommunication Engineering
TMC 1001 : ADVANCED DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 60

***Instruction**: Answer **any 2** questions from **each** Module. **Each** carries **10** marks.*

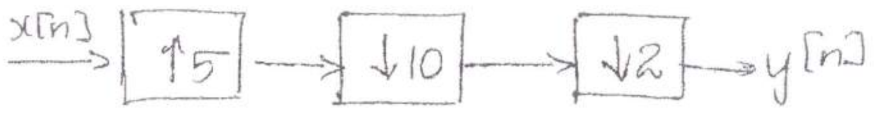
Module – I

1. A digital LP filter is to be designed such that the passband ripple $\leq$ 3 dB at passband edge 1.5 kHz and stopband attenuation of $\geq$ 10 dB at stopband edge of 3 KHz. Sampling frequency = 8000 Hz. Find H (z) using bilinear transformation. **10**

2. Determine H (z) if $H(s) = \dfrac{1}{S^2 + \sqrt{2}S + 1}$, T = 1 sec. using impulse invariant method. **10**

3. a) Let b represent a coefficient in a FIR filter transfer function. With infinite precision, if b = .0075945513536, what will be the quantization error if we are using 7 bits ? What are the effects of such errors in the filter response **5**

   b) Find y [n] in terms of x [n]. **5**



Module – II

4. a) Given $H_1(Z) = \dfrac{1}{\sqrt{2}}\left(1 - Z^{-1}\right)$. Design $H_0(Z)$, $G_0(Z)$ and $G_1(Z)$ for a 2 channel PR QMF bank. **5**

   b) Develop a 2 band polyphase decomposition of $H(z) = \dfrac{p_0 + p_1 z^{-1}}{1 + d_1 z^{-1}}, |d_1| < 1.$ **5**

P.T.O.

5. a) Consider a signal x (t) which is the sum of 2 sinusoids of frequencies f_1 = 500 Hz and f_2 = 1500 Hz and two impulses at times t_1 = 125 ms and t_2 = 130 ms. Assume that we are using a window of width T = 2.5 ms to analyse the signal. Can we resolve, all the components in the signal ? What happens when

   i) T = 0.5 ms

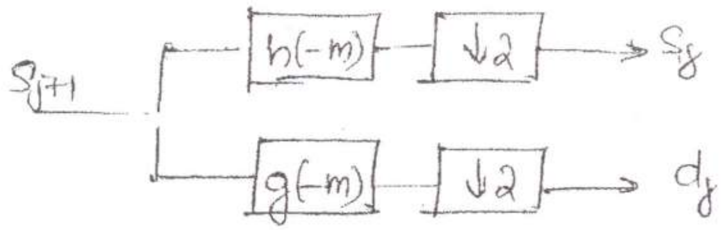
   ii) T = 8 ms **5**

   b) State the properties of wavelets used in continuous wavelet transform ? **5**

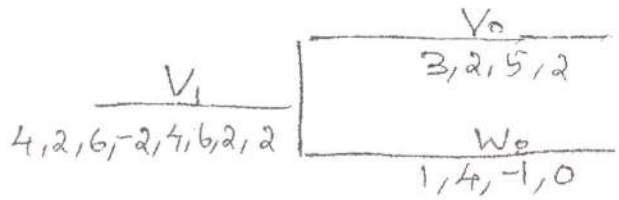
6. Derive the efficient implementation of uniform DFT analysis filter bank. **10**

Module – III

7. Using the filter bank interpretation given by



Verify the following Haar decomposition of a signal in V_1 space to V_0 and W_0 spaces with unnormalized coefficients. **10**



8. Starting from the normal equation, explain Leunson Durbin algorithm to solve the same. **10**

9. Determine the autocorrelation function and power spectral density of the following signal.

   $x(t) = A_C \cos(2\pi f_c\, t + \phi)$ where A_c and f_c are constants. ϕ is a random variable which is uniformly distributed over the interval $(-\pi, \pi)$. **10**
