(Pages : 2) 950

Reg. No. : ....

Name : ....

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme)
TMC – 1001 – ADVANCED DIGITAL SIGNAL PROCESSING

Time : 3 Hours Max. Marks : 100

*Instructions : 1) Answer **any five**.*
*2) **All** questions carry **equal** marks.*

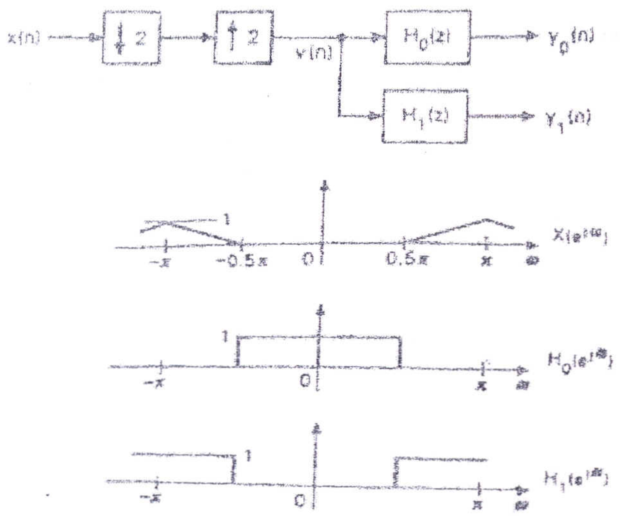
1. a) The signal x(n) is defined by 8

$x(n) = a^n \quad n > 0$
$\quad\;\; = 0 \quad$ otherwise

i) Write the expression and plot the signal, if x(n) is decimated with a factor of three.

ii) Write the expression and plot the signal, if x(n) is interpolated with a factor of three.

b) Consider the structure shown below with input transforms and filter responses as indicated. Sketch the quantities $Y_0(e^{j\omega})$ and $Y_1(e^{j\omega})$ and interpret.

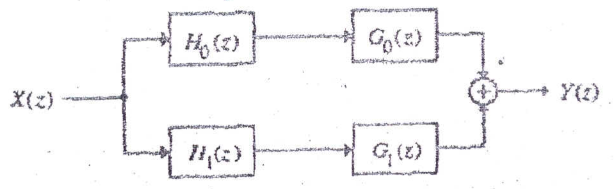


12

P.T.O.

2. a) Explain a 2 channel QMF bank. What are the distortions present ? How is perfect reconstruction achieved ? 10

   b) Let $H_0(z) = (1+z^{-1})/2$ and $H_1(z) = (1-z^{-1})/2$. Determine the synthesis filters $G_0(z)$ and $G_1(z)$ so that the structure shown below is a perfect reconstruction filter bank. 10



3. a) Discuss causality issue of a decimator. 6

   b) Obtain 2 band polyphase decomposition of the transfer function given below : $H(z)= (1-5z^{-1})/(1+3z^{-1})$. 6

   c) Let H(z) represents an FIR filter of length 8 with impulse response coefficients $h(n) = (0.3)^n$ for $0 \leq n \leq 7$ and zero otherwise. Find the poly phase components $E_0(z)$ and $E_1(z)$. 8

4. a) Basis sets of scaling functions span a nested space. State your comments on the above statement. 6

   b) A signal in V_1 space is designated as follows : [4, 2, 6, –2, 4, 6, 2, 2]. Perform Haar decomposition into V_0 and W_0 spaces. 8

   c) State uncertainty principle and discuss its significance using time frequency tiling. 6

5. a) State the relationship between different function spaces in a biorthogonal wavelet system. What is the motivation for designing biorthogonal systems ? 5

   b) Project the function $f(x) = x$ onto the space spanned by $\varphi(x), \psi(x)$, $\psi(2x)$, $\psi(2x-1) \in L^2[0,1]$ where

   $\varphi(x) = 1, 0 \leq x \leq 1/2$
   0, otherwise

   $\psi(x) = 1, 0 \leq x \leq 1/2$
   -1 $1/2 \leq x \leq 1$
   0 otherwise

   Sketch the projection of f(x) to this space. 15

6. What is the basic concept of linear prediction analysis ? Explain Levinson-Durbin algorithm. 20
