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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, March 2014
(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

Instructions : *1) Answer **any two** questions from **each** Module.*
*2) **Each** question carries **10** marks.*

MODULE – I

1. Consider the sampling rate conversion from 4 KHz to 3 KHz with the following specifications : Original sampling rate = 4 KHz, interpolation factor = 3, decimation factor = 2, frequency of interest = 0 to 400 Hz, passband ripple = 0.02 dB, stop band attenuation = 46 dB
   i) Draw the block diagram of the system
   ii) Determine the window type, filter length and cutoff frequency if the window method is used for the combined filter.

2. Design an FIR linear phase digital filter for the following specifications :

   $H_\alpha (e^{j\omega}) = e^{-j3\omega}$; $\omega \leq 3$ rad / sec
   $= 0$; $\omega > 3$ rad / sec

   Given cut off frequency = 3 rad/sec and sampling frequency = 12 rad/sec. Use Hanning window for the design.

3. Design a first-order high pass digital Chebyshev filter with a cutoff frequency of 3 KHz and 1 dB ripple on the passband using a sampling frequency of 8000 KHz. Use bilinear transformation for the design.

P.T.O.

MODULE – II

4. Develop a computationally efficient realization of a factor-of-4 decimator employing a length-16 linear phase FIR filter.

5. Show that the two-channel QMF bank, in general, in a linear, time-varying system with a period of 2.

6. Explain the limitation in using Fourier transform for analysing a signal ? How it is overcome by STFT ? Define wavelet transform and discuss its features compared to CTFT and STFT.

MODULE – III

7. The four-level DWT coefficients 6 are given as follows :
   W = [100 20 16 – 5 – 3 4 2 – 6 4 6 1 2 – 3 0 2 – 1]
   List the wavelet coefficients to achieve each of the following compression ratios :
   a) 2 : 1 b) 4 : 1 c) 8 : 1

8. Obtain the power density spectrum of the sampled data sequence {0, 1, 0, 1, 0, 1, 0, 1} using the Blackman-Tukey method. Use the window function {0, 0.5, 1, 1, 1, 1, 0.5, 0}.

9. Compare non-parametric and parametric methods for power-spectral density estimation. **(6×10=60 Marks)**
