**Code No: EC1902**                                                                   **GEC-R14**

# M. Tech I Semester Regular/Suppl. Examinations, January 2017
# ADVANCED DIGITAL SIGNAL PROCESSING
### (Common to Digital Electronics and Communication Systems & Embedded Systems)

**Time: 3 Hours**                                                          **Max. Marks: 60**

**Note:** Answer any **FIVE** questions.  All Questions carry equal Marks.

**5 × 12 = 60M**

1. Consider the discrete time signal {1,2,3,4,5,6,7,8,9,10,11,12}. Determine the Down Sampling version of the signals for the sampling rate reduction factors D= 2,3 and 4. (12M)

2. a) Explain with neat block diagram of a Sub band Speech coder. (6M)

   b) Explain with neat block diagram 2-Channel QMF bank principle in Signal processing application? (6M)

3. a) Derive necessary expressions for Forward & backward linear predictor, and explain mean square error. (6M)

   b) Determine the reflection coefficient { $K_m$ } of the Lattice filter corresponding to the FIR filter described by the system function H(z).

   $H(z) = A_2(z) = \{ 1 + 2 z^{-1} + (1/3) z^{-2} \}$. (6M)

4. a) Derive necessary expressions for Periodogram smoothening using Blackman-Tukey method? (6M)

   b) Compare performance characteristics of Parametric vs. Non-parametric Power system estimation? (6M)

5. a) The auto Correlation values $\gamma_{yy}$ (0) = 3;  $\gamma_{yy}$ (1) =1;  $\gamma_{yy}$ (2) = 0; for a process consisting of single sinusoid additive white noise. Determine the frequency, its Power and the variance of additive noise.

   Correlation matrix  $\Gamma_{yy}$ = [ 3  1  0 ;  1  3  1 ;  0  1  3 ]. (6M)

   b) Derive the formulae for Autocorrelation and model parameters? (6M)

6. a) Explain the process of finding the FIR Wiener filter co-efficient that minimize the mean square error and derive the necessary equations. (6M)
   b) Explain any two applications of adaptive filters. (6M)

7. The Bartlett method is used to estimate the power spectrum of a signal from a sequence x(n) consisting of N = 2400 samples. (12M)

   i) Determine the smallest value of M of each segment in the Bartlett method that yields a Frequency resolution $\Delta f = 0.01$.

   ii) Repeat part (i) for $\Delta f = 0.02$, also determine Quality factors.

8. Write short notes on the following:

   i)  Oversampling A/D and D/A

   ii)  Sub band Coding of Voice signals

   iii) Interpolation and Decimation in ADSP perspective. (12M)

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