Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH(ECE)/SEM-1/MCE-103/2012-13

2012

ADVANCED DIGITAL SIGNAL PROCESSING

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

1. Answer the following questions : $7 \times 2 = 14$

   i) List various nonparametric methods of power spectrum estimation.

   ii) What is periodogram ?

   iii) What is Ergodic Random Process ?

   iv) What is antialiasing filter ?

   v) What is Decimator ?

   vi) Write any two application of multirate DSP system.

   vii) Write characteristic features of Rectangular window.

GROUP – B

Answer any *four* of the following. $4 \times 14 = 56$

2. a) Write down the design procedure for FIR filter using Fourier series method.
   b) Design a FIR filter with cutoff frequency of 1 kHz and sampling frequency of 4 kHz with 11 samples. Design the FIR filter using rectangular window method. 4 + 10
3. a) Write down the difference between IIR and FIR filters.
   b) For the analog transfer function $H(s) = \frac{2}{s^2 + 3s + 2}$, determine $H(z)$ using impulse in variant method for T = 1 second. 4 + 10
4. a) What is polyphase decomposition ?
   b) Write down the expression of polyphase decomposition FIR filters.
   c) Write down the applications of multirate DSP.
5. a) Derive the frequency spectrum of the output of down sampler.
   b) Describe about Quadrature Mirror Filter Bank. 9 + 5
6. a) Derive periodogram estimation of power spectrum.
   b) Compute the periodogram of the signal vector { 1, 1, 1, 1 } using DFT. 6 + 8
7. a) Prove that periodogram is not a consistent estimate of the true power density spectrum.
   b) Write noise with power spectral density of 6^2 is passed through a filter with impulse response $h(n) = 0 \cdot 5^n u(n)$. What is the output PSD ?
8. a) What is Adaptive Filter ? Describe with suitable structure.
   b) Write down the different uses of Adaptive Filters. 8 + 6

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