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MEMT - 202

M.E./M.Tech., II Semester

Examination, June 2016

Digital Signal Processing

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Determine the inverse z-transform of $x(z) = \log(1 + az^{-1})$. 7

   b) In an LTI system, the impulse response $h(n) = c^n$ for $n \le 0$. Determine the range of values of c, for which the system is stable. 7

2. a) Compare the hamming window and Kaiser windows. 7
   b) A low-pass filter should have the frequency response given below. Find the filter co-efficients $h_d(n)$. Also determine τ so that $h_d(n) = h_d(-n)$.

$$H_d(e^{jw}) = \begin{cases} e^{-jw\tau}, & -w_c \le w \le w_c \\ 0, & w_c < |w| \le \pi \end{cases}$$ 7

3. a) The frequency response of a digital filter is $H(e^{jw}) = (0.4 + 0.7\cos 2w - 0.5\cos 4w)e^{-j(0.3\pi + 4w)}$
   Determine the phase delay and group delay. 7
   b) Describe and explain the specifications of Digital IIR low pass filter. 7

4. a) Compare the fixed point and floating point arithmetic. 7
   b) Draw and explain the flow graph of four point decimation in time FFT algorithm. 7

5. a) Explain briefly about the digital matched filters for Radar signals. 7
   b) Explain about Air borne surveillance Radar for air traffic control. 7

6. a) The transfer function of a system is given by, $H(z) = \frac{1}{1+0.5z^{-1}} + \frac{1}{1-2z^{-1}}$. Determine the stability and causality of the system for
   i) $ROC : |z| > 2$
   ii) $ROC : |z| < 0.5$ 7
   b) Obtain a general expression for the frequency response of linear phase FIR filters. 7

7. a) Explain the procedure for designing an FIR filter using the Kaiser window. 7
   b) Determine the response of discrete time LTI system governed by the difference equation, $y(n) = -0.8y(n-1) + x(n)$, when the input is unit-step and initial condition $y(-1) = 0$. 7

8. a) Write short notes on: 7
   i) Matched z-transform
   ii) Properties of IIR filters
   b) Explain how you would use the FFT algorithm to compute the IDFT. 7

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