Code: 9A04603

$\boxed{\textbf{R09}}$

B.Tech III Year II Semester (R09) Supplementary Examinations May/June 2016
DIGITAL SIGNAL PROCESSING
(Common to EIE, E.Con.E, ECC and ECE)

Time: 3 hours   Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1   Check the following systems for memory and stability:
    (i) $y(n) = 3^n u(n)$.
    (ii) $y(n) = e^{x(n)}$.
    (iii) $y(n) = \cos(0.5n\Pi) u(n)$.

2   Given the two sequences:
(a) $x_1(n) = 1$ $0 \le n \le 3$.
(b) $x_2(n) = (2)^{-n}$ $0 \le n \le 3$.
    Find circular convolution of above sequences. Also verify the answer with DFT method.

3   Explain radix 2 DIF-FFT algorithm in detail. Explain how calculations are reduced.

4   Consider an LTI system, initially at rest, described by the difference equation:
    $y(n) = (1/4) y(n-2) + x(n)$
    (i) Determine the impulse response of the system.
    (ii) Realize the system in Direct form-I and in Parallel form.

5   (a)   Compare Impulse Invariant and Bilinear Transformation methods of IIR filter approximations.
   (b)   Use Bilinear Transformation method to find H(z) for:
       $H(s) = 1/(s + 0.5)^2$

6   Design high-pass filter using hamming window with a cutoff frequency of 1.5 rad/sec and N = 9.
    Consider:
       $H_d(e^{j\omega}) = e^{-j\alpha\omega}$ $\omega_c \le |\omega| \le \pi$
             = 0   otherwise
    Also find $H(e^{j\omega})$.

7   (a)   What are the advantages of multi rate signal processing?
   (b)   Sketch the following signals:
       $x_1(n) = 3n$ $n > 0$
           =0   otherwise
    Also sketch decimated and interpolated version of above signal with factor of '4'.

8   Write short notes on the following:
(a) Coding redundancy.
(b) Single Echo filter.
(c) STFT.

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