

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

- 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) $x_1(n) = 1 \quad 0 \leq n \leq 3$.
(b) $x_2(n) = (2)^{-n} \quad 0 \leq n \leq 3$.
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:
$$H_d(e^{j\omega}) = \begin{cases} e^{-j\alpha\omega} & \omega_c \leq |\omega| \leq \pi \\ 0 & \text{otherwise} \end{cases}$$

Also find $H(e^{j\omega})$.
- 7 (a) What are the advantages of multi rate signal processing?
(b) Sketch the following signals:
$$x_1(n) = \begin{cases} 3n & n > 0 \\ 0 & \text{otherwise} \end{cases}$$

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.
