

(3 Hours)

[Total Marks :80

- N.B. : (1) Question no. 1 is compulsory.
 (2) Solve any three questions from remaining five questions.
 (3) In all four questions to be attempted.
 (4) Figures to the right indicate full marks.

1. (a) Explain multirate signal processing with applications. 20
 (b) If $h(n) = \{1, 2, 3, 4\}$ is impulse response of FIR Filter, Realize the filter in direct form.
 (c) State and prove Parseval's Theorem.
 (d) State advantage and disadvantage of digital filters.
2. (a) (i) $x(n) = \{1, 2, 3, 4\}$ find DFT of $x(n)$ 10
 (ii) Using results obtained in part (i) and otherwise find DFT of following sequences
 $a(n) = \{4, 1, 2, 3\}$ $b(n) = \{2, 3, 4, 1\}$ $c(n) = \{3, 4, 1, 2\}$
 $d(n) = \{4, 6, 4, 6\}$
 (b) A digital filter is describe by the following differential equation 10
 $y(n) = 0.9 y(n-1) + bx(n)$
 (i) Determine b such that $|H(0)| = 1$
 (ii) Determine the frequency at which $|H(w)| = \frac{1}{\sqrt{2}}$
 (iii) Identify the filter type based on the passband.
3. (a) If $x(n) = \{1, 2, 3, 4, 5, 6, 7, 8\}$, Find $X(K)$ using DITFFT. Compare computational complexity of above algorithm with DFT. 10
 (b) Show the mapping from S plane to Z plane using Impulse Invariant Method 10
 and explain its limitation. Using this method, determine $H(Z)$ if
 $H(s) = \frac{3}{(s+2)(s+3)}$ if $T = 0.1$ sec
4. (a) Design a Linear Phase FIR Low Pass filter of Length 7 and cut off frequency 10
 1 rad/sec using rectangular window.
 (b) If $x(n) = \{1, 2, 3, 2\}$ and $h(n) = \{1, 0, 2, 0\}$ 10
 (i) Find circular convolution using time domain method.
 (ii) Find linear convolution using circular convolution.

[TURN OVER

5. (a) Design a digital Butterworth filter for following specifications using Bilinear transformation technique 10
- Attenuation in Pass band = 1.93dB,
 Pass band Edge frequency = 0.2π ,
 Attenuation in Stop band = 13.97dB,
 Stop band Edge frequency = 0.6π .
- (b) With a suitable block diagram describe sub-band coding of speech signals. 10
6. Attempt the following :-
- (a) Short note on dual tone multifrequency detection using Goertzel's algorithm 8
- (b) Compare FIR and IIR filters. 6
- (c) Finite word length effect in digital filters. 6
-

MUPD18048 SARDAR PATEL
 5/16/2016 2:15:07 PM