Q.P.Code:16204

(3 hours) [Total Marks: 80]

N.B: 1) Question number **1 is compulsory**
2) Solve any **three** questions out of the remaining **five** questions
3) In all four questions to be attempted.
4) **Figures** to the **right** indicate full marks

Q.1 (a) Derive relationship between DFT and DTFT. (05)

(b) Compare: Impulse invariant technique and bilinear transformation technique. (05)

(c) Define phase delay and group Delay. (05)

(d) Explain interpolation process with frequency spectrum. (05)

Q2) (a) Develop **Composite radix DITFFT** flow graph for $N = 6 = 2 \times 3$ (10)

(b) Analog filter Transfer function is $H(s) = \frac{4}{(S+1)(S^2+4S+5)}$ obtain equivalent digital

filter transfer function H(Z) using impulse invariant technique by taking T=0.5 sec (10)

Q.3 (a) State two important properties of DFT which are used to derive FFT. How Computational

Complexity of DITFFT algorithm is determined from flow graph. Derive necessary formulas. (10)

(b) $y(n) = 2x(n) + \frac{4}{5}x(n-1) + \frac{3}{2}x(n-2) + \frac{2}{3}x(n-3)$ (10)

Determine lattice realization.

Q.4 (a) Using frequency sampling method, design FIR band pass filter for following specifications

Sampling frequency =8000Hz

Cut Off frequency $= f_{c_2} = 3000$Hz

Cut Off frequency $= f_{c_1} = 1000$Hz

Determine filter coefficients for N=7 (10)

(b) Write short note on: Dual tone multi frequency detection (06)

(c) What is multi rate DSP? State its applications. (04)

Q(5) (a) Design a Butterworth digital IIR filter using BLT by taking T = 0.1sec to (10)

satisfy following specifications

$0.6 \leq |H(e^{jw})| \leq 1.0$ $0 \leq w \leq 0.35\pi$

$|H(e^{jw})| \leq 0.1$ $0.7\pi \leq w \leq \pi$

Turn Over

(b) x(n) ={ 2,3.4,5} and y(n)={5,2,3,4}   (10)

    (i) Find circular convolution using time domain method

    (ii) Find circular convolution using frequency domain method

    (iii) Compute linear convolution. Comment on your results.

Q6) (a) The transfer function for discrete time causal system is given by   (10)

$$H(z) = \frac{1 - z^{-1}}{1 - 0.2z^{-1} - 0.15z^{-1}}$$

    (i)Find difference equation

    (ii) Draw Direct Form-I and Direct form-II realization structure

    (iii)Draw cascade and parallel realization

(b) Explain the effects of coefficients quantization in FIR filters   (05)

(c) State Parserval's theorem. Verify it for x (n) = {1, 2, 3, 4}   (05)

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