G 1056 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Sixth Semester

Branch : Electronics and Communication Engineering/Information Technology/Applied Electronics and Instrumentation Engineering/Electronics and Instrumentation Engineering

DIGITAL SIGNAL PROCESSING (LTAS)

(Old Scheme—Prior to 2010 Admissions)

[Supplementary/Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Define signal flow graph. Draw the signal flow graph of first order digital filter.
2. Determine the order of low pass Butterworth filter that has 3 dB attenuation at 500 Hz and an attenuation of 40 dB at 1000 Hz.
3. What are the properties of FIR filters ?
4. Mention the necessary and sufficient condition for linear phase characteristics in FIR filter.
5. What are the differences and similarities between DIF and DIT algorithms ?
6. If H(k) is the N-point DFT of a sequence h (n), prove that H(k) and H (N-k) are complex conjugates.
7. Express the fraction (–7/32) in signed magnitude and two's complement notations using 6 bits.
8. Compare fixed point and floating point representations.
9. Explain sub band coding.
10. Write down the main features of DSP based instruments.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Consider a second order IIR filter with $H(z) = \frac{1}{(1-0.5z^{-1})(1-0.45z^{-1})}$. Find the effect on quantization on pole locations of the given system function in direct form and in cascade form. Take b = 3 bits.

Or

12. Explain lattice structure of IIR system.

13. Using a rectangular window technique design a low pass filter with pass band gain of unity, cut off frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7.

Or

14. A band pass FIR filter of length 7 is required. If is to have lower and upper cut-off frequencies of 3 kHz and 5 kHz respectively. The sampling frequency is 24 kHz. Determine the filter coefficients using Hanning window. Assume the filter to be causal.

15. Discuss in detail the important properties of the Discrete Fourier Transform.

Or

16. Compute a 8 point DFT using DIT FFT radix z algorithm :

$X(n) = \{0.5, 0.5, 0.5, 0.5, 0, 0, 0, 0\}$.

17. Consider the truncation of negative fraction numbers represented in $(\beta + 1)$ – bit fixed point binary form including sign bit. Let $(\beta$-b) bits be truncated. Obtain the range of truncation errors for signed magnitude, 2's complement and 1's complement representations of the negative numbers.

Or

18. Consider the transfer function $H(z) = H_1(z)H_2(z)$ where $H_1(z) = 1/(1 - a_1 z^{-1})$ and $H_2(z) = 1/(1 - a_2 z^{-1})$. Find the output round off noise power. Assume $a_1 = 0.5$ and $a_2 = 0.6$ and find output round off noise power.

19. Discuss in detail about (a) DSP based measurement system ; (b) Radar signal processing.

Or

20. Compare Channel vocoder and homomorphic vocoder.

(5 × 12 = 60 marks)