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# Question Paper Code : 60459

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electrical and Electronics Engineering

EC 2314/10144 EC 502/EC 2361/10133 EE 502 – DIGITAL SIGNAL PROCESSING

(Common to Electronics and Communication Engineering and Instrumentation and Control Engineering)

(Regulations 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is quantization error?

2. What is Nyquist rate of the analog signal?

3. Given a difference equation $y(n) = x[n] + 3x[n-1] + 2y[n-1]$. Determine the system function $H(z)$.

4. Find the stability of the system whose impulse response $h(n) = \left(\frac{1}{2}\right)^n u(n)$.

5. Differentiate IIR and FIR filter.

6. Give relationship between DTFT and Z transform. What is meant by quantization ever?

7. What is the need for employing window for designing FIR filter?

8. What is Warping effect? What is its effect on frequency response?

9. What is meant by bit reversed addressing mode? What is the application for which this addressing mode is preferred?

10. Compare the RISC and CISC processors.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Discuss the properties of discrete time sinusoidal signals and continuous time sinusoidal signal. (8)

(ii) Consider the analog signal $x(t) = 3\cos 100\,\pi t$.

(1) Determine the minimum sampling rate required to avoid aliasing.

(2) If the signal is sampled at the rate Fs = 200 Hz, What is the discrete time signal obtained after sampling? (8)

Or

(b) (i) Discuss the quantization of analog signal. (8)

(ii) Discuss the sampling of analog signals. (8)

12. (a) (i) Find the Z transform and its associated ROC for the following discrete time signal $x[n] = \left(\frac{-1}{5}\right)^n u[n] + 5\left(\frac{1}{2}\right)^{-n} u[-n-1]$. (8)

(ii) Evaluate the frequency response of the system described by system function $H(z) = \frac{1}{1-0.5z^{-1}}$. (8)

Or

(b) Using z-transform determine the response $y[n]$ for $n \geq 0$ if $y[n] = \frac{1}{2}y[n-1] + x[n]$, $x[n] = \left(\frac{1}{3}\right)^n u(n) y(-1) = 1$. (16)

13. (a) (i) State and prove convolution property of DFT. (6)

(ii) Find the inverse DFT of

$$X(K) = \left\{7, -\sqrt{2} - j\sqrt{2}, -j, \sqrt{2} - j\sqrt{2}, 1, \sqrt{2} + j\sqrt{2}, j, -\sqrt{2} + j\sqrt{2}\right\}. \quad (10)$$

Or

(b) (i) Derive decimation-in-time radix-2 FFT algorithm and draw signal flow graph for 8-point sequence. (8)

(ii) Using FFT algorithm, compute the DFT of $x(n) = \{2, 2, 2, 2, 1, 1, 1, 1\}$. (8)

14. (a) For the analog transfer function $H(s)=2/(s+1)(s+3)$ determine $H(z)$ using bilinear transformation. With $T=0.1\text{sec}$. (16)

Or

(b) Design an ideal high pass filter with $H_d(e^{jw})=\begin{cases}1 & \pi/4 \le |\omega| < \pi \\ 0 & |\omega| \le \pi/4\end{cases}$ using Hamming window with $N=11$. (16)

15. (a) Explain Von Neumann, Harvard architecture and modified Harvard architecture for the computer. (16)

Or

(b) (i) Explain how convolution is performed using a single MAC unit (8)

(ii) Discuss the addressing modes used in programmable DSPs. (8)