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Question Paper Code : 31795

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fifth Semester

Electrical and Electronics Engineering

EC 2314 — DIGITAL SIGNAL PROCESSING

(Regulation 2008)

Time : Three hours — Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Define BIBO stable.

2. State and prove the time reversal property of Z-transform.

3. Determine the z-transform and ROC for the signal $x(n) = \delta(n-k) + (n+k)$.

4. Prove the convolution property of z-transform.

5. How is butterfly structure helpful in DFTcomputation?

6. What information do we get from magnitude and phase representation?

7. Draw the Direct form I realization of the system

   $y(n)=0.5\, y(n-1)+0.4\, x(n-1)$.

8. Obtain the transfer function $H(z)$ of a IIR filter given $H(s)=1/(s+1)$ using Bilinear transformation.

9. Mention one important feature of Harvard architecture.

10. What is the advantage of pipelining?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Give two examples for static. Time variant, Casual and linear systems. (8)

(ii) Tabulate the difference between energy and power signal with examples. (8)

Or

(b) (i) State whether the following system is linear, time varying, casual and stable $y(n) = nx^2(n)$. (8)

(ii) State the expression for Nyquist rate? If the sampling rate is less than the nyquist rate, what happens? Justify it with an example. (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 $H(z) = \frac{1}{1-0.5\,z^{-1}}$ (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) The first five points of the eight point DFT of a real valued sequence are $\{0.25, 0.125 - j\,0.3018, 0, 0.125 - j\,0.0518, 0\}$. Determine the remaining three points. (4)

(ii) Compute the eight point DFT of the sequence $x = [1,1,1,1,1,1,1,1]$, using Decimation in Frequency FFT algorithm. (12)

Or

(b) Consider the sequences

$x_1(n) = \{0, 1, 2, 3, 4\}$, $x_2(n) = \{0, 1, 0, 0, 0\}$

$s(n) = \{1, 0, 0, 0, 0\}$

(i) Determine a sequence $y(n)$ so that $Y(k) = X_1(k) X_2(k)$

(ii) Is there a sequence $x_3(n)$ such that $S(k) = X_1(k) X_3(k)$?

14. (a) (i) For the analog transfer function $H(s) = \frac{2}{(s+1)(s+3)}$. Determine $H(z)$ using bilinear transformation. with $T = 0.1$ sec. (8)

(ii) Convert the analog filter $H(s) = \frac{0.5(s+4)}{((s+1)(s+2))}$ using impulse invariant transformation $T = 0.31416$ S. (8)

Or

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

15. (a) Explain the desirable features of DSP processors. Describe the general architecture of a typical DSP processors. (16)

Or

(b) (i) Describe the important addressing modes of a DSP processor. (8)

(ii) Compare DSP processors with other general purpose processors. (8)