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Question Paper Code : 51409

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Fifth Semester

Electrical and Electronics Engineering

EC 2361/EC 2314/EC 65/10144 EC 502/10133 EE 502 — DIGITAL SIGNAL PROCESSING

(Common to Sixth Semester Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2008/2010)

(Also common to PTEC 2361 – Digital Signal Processing for B.E. (Part-Time) Fifth Semester Electronics and Instrumentation Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Consider the analog signal $x(t) = 3\cos 50\pi t + 10\sin 300\pi t - \cos 100\pi t$. What is the Nyquist rate for this signal?

2. State Shannon's sampling theorem.

3. What is meant by Region of Convergence?

4. State final and initial value theorem of Z-transform

5. State circular frequency shift property of DFT.

6. Compare DIT radix-2 FFT and DIF radix -2 FFT.

7. Define pre-warping effect. Why it is employed?

8. Give Hamming window function.

9. List the various registers used with ARAU.

10. What are the different buses of TMS 320C54x processor and list their functions?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Check the causality and stability of the systems $y(n)=x(-n)+x(n-2)+x(2n-1)$. (8)

(ii) Check the system for linearity and time invariance $y(n)=(n-1)x^2(n)+c$. (8)

Or

(b) Explain the digital signal processing system with necessary sketches and give its merits and demerits. (16)

12. (a) (i) Find the Z – Transform and ROC of $x(n)=r^n\cos(n\theta)u(n)$. (8)

(ii) Find Inverse Z – Transform of $X(z)=z/\left[3z^2-4z+1\right]$, ROC $|z|>1$. (8)

Or

(b) (i) Determine the DTFT of the given sequence $x[n]=a^n(u(n)-u(n-8)), |a|<1$. (8)

(ii) Prove the linearity and frequency shifting theorems of the Discrete Time Fourier Transform. (8)

13. (a) An 8-point sequence is given by $x(n)$ = {2, 2, 2, 2, 1, 1, 1, 1) compute DFT of $x(n)$ using radix 2 DIT FFT. (16)

Or

(b) (i) Determine 8 Point DFT of the sequence $x(n)=\{1,1,1,1,1,1,0,0\}$. (12)

(ii) Find circular convolution of the sequences using concentric circle method. $x_1=\{1,1,2,1\}$ and $x_2=\{1,2,3,4\}$. (4)

14. (a) Using a rectangular window technique design a LPF with pass band gain of unity, cutoff frequency of 1000 Hz and working sampling frequency of 5 kHz. The length of impulse is 7. (16)

Or

(b) Design a Chebyshev filter for the following specification using bilinear transformation. (16)

$0.8 \le \left|He^{j\omega}\right| \le 1 \qquad 0 \le \omega \le 0.2\pi$

$\left|He^{j\omega}\right| \le 0.2 \qquad 0.6\pi \le \omega \le \pi$

15. (a) Draw and explain the architecture of TMS 320C54x processor. (16)

Or

(b) Explain in detail about MAC unit and Pipelining. (16)

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