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Question Paper Code : 91412

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Electrical and Electronics Engineering

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

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

(Regulation 2008/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Test whether the system governed by the relation $y(n) = \sum_{k=-\infty}^{n} x(k)$ is linear time –invaraint or not?

2. What is aliasing effect?

3. Find the z transform and its ROC of the discrete-time signals

   $x(n) = -a^n u(-n-1), a > 0$

4. Define discrete Fourier series representation for a periodic sequence.

5. What is zero padding? What are its uses?

6. State Parsavel's relation for DFT.

7. What are the advantages of FIR filter?

8. What are the properties of Chebyshev filter?

9. What are the different stages in pipelining?

10. List the various registers used with ARAU of DSP processor?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What is energy and power signals? Determine whether the following signals are power or energy or neither of these two. (6)

(1) $x(n) = (1/5)^n u(n)$

(2) $x(n) = \exp\{j(\pi n/3) + (\pi/7)\}$

(ii) Explain the following with respect to discrete-time system: (6)

(1) Casuality

(2) Stability

(3) Dynamic system

(iii) Explain what is meant by quantization? (4)

Or

(b) (i) What is system? Explain the classification of systems. (5)

(ii) What is sampling? Explain the operation of sampling process. (7)

(iii) What is meant by spectral density? Explain. (4)

12. (a) (i) Find the Z transform and its ROC of $x(n) = \left(\frac{1}{2}\right)^{|n|} + \left(-\frac{1}{2}\right)^{|n|}$. (10)

(ii) Find the linear convolution of $x(n) = \{1, 2, 3, 4, 5, 6, 7\}$ with $h(n) = \{2, 4, 6, 8\}$. (6)

Or

(b) (i) What is frequency response? Explain its properties. (6)

(ii) Find the inverse z-transform of $X(Z) = \frac{4Z}{(Z+1)^2(Z+3)}$ for all possible ROCs. (10)

13. (a) (i) State and prove convolution property of DFT. (8)

(ii) Find the 4-point inverse DFT of X(k) = {10, - 2 + 2j, - 2, - 2 - 2j} (8)

Or

(b) (i) Derive decimation-in-frequency, radix-2, FFT algorithm for evaluating DFT. (8)

(ii) Obtain the 8-pint DFT of the sequence x(n){1, 1, 1, 1} (8)

14. (a) (i) Implement the following system function using cascade structure:(6)

$$H(Z)=\frac{1}{(1+2Z^{-1})(1-Z^{-2})}$$

(ii) Design a low pass FIR filter for the following specifications using rectangular window function: (10)

Cut-off frequency = 500 Hz

Sampling frequency = 2000 Hz

Order of the filter = 10

Or

(b) (i) Convert the following analog transfer function into digital using impulse invariant technique with sampling period T=1 sec. (10)

$$H(s)=\frac{s+1}{(s+3)(s+5)}$$

(ii) Explain what is meant by warping? (6)

15. (a) (i) Explain the architecture of DSP processor with neat block diagram. (8)

(ii) Explain about direct addressing mode in DSP processor. (8)

Or

(b) (i) Explain the types of operations performed by .L functional mode. (8)

(ii) Explain what is meant by bit reversed addressing mode. (8)
