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Register Number: ……..

**B.E DEGREE EXAMINATIONS: MAY 2015**

(Regulation 2009)

Sixth Semester

**ELECTRONICS AND INSTRUMENTATION ENGINEERING**

EIE112**:** Digital Signal Processing

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. The process of conversion of continuous time signal into discrete time signal is known as -------
   a) Sampling b) Aliasing
   c) Convolution d) Deconvolution
2. The discrete time system , y(n) = x(n-3)-4x(n-10) is a,
   a) Memoryless system b) Dynamic system
   c) Time invariant system d) Time varying system
3. The ROC of the signal $x(n) = a^n$ for $-5<n<5$ is
   a) Entire z-plane except z = 0 b) Entire z-plane
   c) Entire z-plane except z = 0 and z = ∞ d) Entire z-plane except z = ∞
4. If $F\{x(n)\} = X(e^{jw})$, then F{x(n-3)} will be,
   a) $e^{j3w} X(e^{jw})$ b) $e^{j3w} X(e^{-jw})$
   c) $e^{-j3w} X(e^{-jw})$ d) $e^{-j3w} X(e^{jw})$
5. The complex valued phase factor/twiddle factor, $W_N$ can be represented as
   a) $e^{-j2\pi/N}$ b) $e^{-j2\pi N}$
   c) $e^{-j2\pi}$ d) $e^{-j2\pi kN}$
6. In an N-point sequence, if N = 16, the total number of complex additions and multiplications using Radix-2 FFT are,
   a) 64 and 80 b) 64 and 32
   c) 24 and 12 d) 80 and 64
7. In FIR filters, the Gibbs oscillations are due to
   a) Gradual transition from pass-band to stop-band b) Non-linear phase characteristics
   c) Non-linear magnitude characteristics d) Sharp transition from pass-band to stop-band

8. In Impulse Invariant transformation the digital frequency 'ω' for a given analog frequency,Ω is given by,

a) $\omega = \tan \Omega T$ b) $\omega = \Omega/T$

c) $\omega = T/\Omega$ d) $\omega = \Omega T$

9. The architecture that employs instruction level parallelism is,

a) VLIW Architecture b) Harvard Architecture

c) Von Neumann Architecture d) Modified Harvard Architecture

10. The total physical memory space of TMS320 C54x family of processors is

a) 128k-words b) 192k-words

c) 64k-words d) 224k-words

**PART B (10 x 2 = 20 Marks)**

11. Test the system y(n) = x(n+1) + x(n+2) for time invariance.
12. What is Nyquist rate?
13. State the final value theorem and initial value theorem with regard to Z-transform.
14. Differentiate linear convolution and circular convolution.
15. What is the relation between DTFT and DFT.
16. List any four properties of DFT.
17. Write the procedure for designing FIR filter using windows.
18. What is frequency warping?
19. List the addressing modes of TMS 320C54x processors.
20. Write the MATLAB commands used for the transfer function.

**PART C (5 x 14 = 70 Marks)**

21. a) (i) Test the system y(n) = x(n)-2x(n-1), (10)

(i) Static or Dynamic System (ii) Time variant or time invariant system

(iii) Linear or Nonlinear system (iv) Casual or Noncasual system

(ii) What is the Nuquist sampling frequency for the signal (4)

$$x(t) = 4\sin(4\pi 100t) + \cos(\pi 300t + \frac{\pi}{4})?$$

**(OR)**

b) (i) Let an analog signal, Xa(t) = 10 Cos200πt. If the sampling frequency is 150 Hz, find discrete time signal x(n). Also find an alias frequency corresponding to Fs = 150 Hz. (7)

(ii) Determine whether the following signals are energy signal or power signal. (7)

(i) $x[n]=\left(\frac{1}{4}\right)^n u[n]$

(ii) $x(t)=e^t\,u(t)$

22. a) Determine the response of LTI discrete time system governed by the difference equation, y(n) – 0.2 y(n-1) – 0.03 y(n-2) = x(n) + 0.4 x(n-1) for the input, $x(n) = 0.2^n$ u(n) and with initial condition, y(-2) = 0, y(-1) = 0.5.

**(OR)**

b) (i) Perform circular correlation of the two sequences, x(n) = {1,1,2,1} and y(n) = {2,3,1,1} (10)

(ii) Find the Fourier transform of x(n) = {2,1,2} (4)

23. a) Compute the DFT of the sequence, x(n) = {0,1,2,1}. Sketch the magnitude and phase spectrum.

**(OR)**

b) Compute 8-point DFT of the discrete time signal, x(n) = {2,1,2,1,1,2,1,2} using radix-2 DIT FFT.

24. a) Derive the frequency response of linear phase FIR filter when impulse response is symmetric with centre of symmetry at (N-1)/2 and N is odd.

**(OR)**

b) (i) For the analog transfer function, H(s) = 2 / $s^2$ + 3s +2. Determine H(z) using bilinear transformation with T = 1 sec. (10)

(ii) Compare Butterworth and Chebyshev Type-I filters. (4)

25. a) Draw the simplified architecture of TMS 320C54x processors and explain.

**(OR)**

b) Write a MATLAB program to perform4-point DFT of the discrete time sequence x(n) = {1,1,2,3) using FFT. 14

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