Code No. 2370 / N

FACULTY OF ENGINEERING

B.E. 3/4 (EEE) II-Semester (New) (Main) Examination, April / May 2013

Subject : Digital Signal Processing

Time : 3 Hours **Max. Marks: 75**

Note: Answer all questions of Part - A and answer any five questions from Part-B.

PART – A (25 Marks)

1. The unit sample response of a linear shift invariant system is known to be zero except in the interval $N_0 \le n \le N_1$. The input x(n) is known to be zero except in the interval $N_2 \le n \le N_3$. As a result the output is constrained to be zero except in the interval $N_4 \le n \le N_5$. Determine N_4, N_5 in terms of N_0, N_1, N_2 and N_3. (3)
2. Determine whether the following signal is energy signal or power signal $x(n)=\cos w_o n u(n)$. (2)
3. For the given $x_1(n)$, $x_2(n)$ and N. Compute N-point circular convolution. $x_1(n)=\{1, -1, 2, 3\}$, $x_2(n) = \{0, 1, 2, 3\}$, N=5. (3)
4. What is periodic convolution? (2)
5. Find the Z-transform and ROC of the following signal. $x(n)=(-1)^n u(n)$. (3)
6. Write initial value theorem and final value theorem of z-transform. (2)
7. What is bilinear transform and which integral approximation is used for that ? (2)
8. Find the digital filter H(z) from given analog filter below using impulse invariant method. $H(s)=\frac{1}{(s+1)(s+2)}$ (3)
9. Stop band attenuation of a window and main lobe width of a window are related to which parameters of FIR filter. (2)
10. Write DSP applications in speech processing. (3)

PART – B (5x10=50 Marks)

11. (a) Determine DTFT of the following system
    $y(n)-3/4y(n-1)+1/8y(n-2)=x(n)$ (4)
    (b) Determine the convolution of $x(n)=3^n u(-n)$; $h(n)=(1/3)^n u(n-2)$. (6)

12. (a) Determine whether each of the following systems defined below is (i) linear (ii) time invariant. (10)
    $y(n)=x(n)\cos w_0 n$ and
    $y(n)=x(-n-2)$
    (b) Find the impulse response of the following systems
    $y(n)-3y(n-1)-4y(n-2)=x(n)+2x(n-1)$

13. (a) Determine all possible x(n) associated with the z-transform
    $$X=\frac{5z^{-1}}{(1-2z^{-1})(1-3z^{-1})}$$
    (b) Find the step response of the following systems using one sided Z-transform method
    $y(n)-0.6y(n-1)-0.08y(n-2)=x(n)$

14. Obtain radix-2DIFFFT algorithm and find DFT of the following signal
    $x(n)=\{1, 2, 3, 4, 4, 3, 2, 1\}$ (10)

15. Design a Butterworth low pass filter for the specifications give below:
    (i) -3db cut off frequency of 100 rad/sec
    (ii) -25 db cutoff frequency of 250 rad/sec

16. (a) Write the design procedure of FIR filter using window technique. (5)
    (b) Draw the architecture of ADSP processor. (5)

17. (a) State and prove symmetry properties of DTFT. (5)
    (b) State and prove the condition for minimum sampling frequency to avoid aliasing in time domain sampling. (5)

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