Code No. 2060

FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II-Semester (Main) Examination, April / May 2013

Subject : Signal Analysis and Transform Techniques

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. If x(t)=δ'(t+3)-3δ(t=3)+4δ(t+2) then sketch G(t) = $\int_{-\infty}^{+\infty} x(t)dt$. (3)
2. If x(t) $x(t)=\cos\left(\frac{\pi}{3}t\right)+\sin\left(\frac{\pi}{4}t\right)$ is x(t) periodic, if periodic, if periodic find the period of x(t). (3)
3. Show clearly the S-plane and Z-plane corresponding. (3)
4. Write the properties of convolution. (3)
5. If x[n] = $-a^n u[-n-1]$ find the Fourier transform of x[n] (3)
6. Write the relation between exponential and trigonometric Fourier series coefficients. (2)
7. What is the Fourier transform of unit step signal? (2)
8. Find the Laplace transform of x(t) = $e^{-at}u(-t)$. (2)
9. Express the ramp sequence in terms of step sequence. (2)
10. Clearly show that the unit step sequence is a power or energy signal. (2)

PART – B (5x10=50 Marks)

11. (a) State and prove the Parseval's power theorem applicable to periodic signals. (5)
    (b) Prove that the half wave symmetric signal contains only odd harmonics in the Fourier series. (5)

12. (a) If x(t) = 1 |t| < a
    = 0 otherwise obtain the Fourier transform of x(t) (5)
    (b) If $X(\omega)=j\frac{d}{d\omega}\left\{\frac{e^{j2\omega}}{1+\frac{j\omega}{3}}\right\}$ is the Fourier transform of a signal x(t), then find the signal x(t). (5)

13. Consider a continuous time linear time invariant system for which the input x(t) and output y(t) are related by $\frac{d^2y(t)}{dt^2}+\frac{dy(t)}{dt}-2y(t)=x(t)$
    (a) Find the system function (4)
    (b) Determine the impulse response for each of the following cases:
    (i) the system is stable (3)
    (ii) the system is causal and stable (3)

..2

14.(a) Impulse response of the system h[n]=a^nu[n], determine weather the system is causal and stable. (4)

(b) Find the convolution of the following signal x[n]and h[n] (6)

x[n]={1, 1, 1, 1} and h[n]={1, 1, 1}

↑ ↑

15.(a) State and prove the time reversal and time shifting properties of the z-transform (6)

(b) If $X(Z)=\frac{z(z-4)}{(z-1)(z-2)(z-3)}$ is the Z-transform of x(n), state all possible ROC's and for which ROC X(z), the Z-transform of casual sequence x[n]. (4)

16.(a) Determine the Fourier coefficient of x[n] which is the periodic extension of the sequence {0, 1, 2, 3} with fundamental period of N_o=4. (6)

↑

(b) Verify the frequency shifting property $e^{j\Omega_0 n}x[n] \leftrightarrow X[\Omega-\Omega_0]$ (4)

17. (a) Write the Drichlet conditions.

(b) Determine the 90% energy containment Bandwidth of the signal $x(t)=\frac{1}{(t^2+a^2)}$.

(c) Find the initial and final values of the signal x(t) whose Laplace transform

$$X(s) is \frac{10(s+4)}{(s+2)(s^2-2s+2)}$$

*****