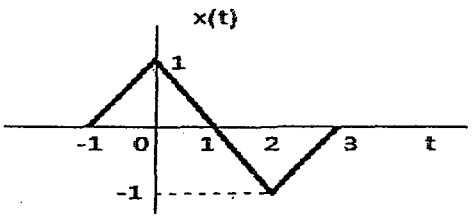
REG. NO. | | | | | | | | | | 13

B.E./B.TECH(FULL TIME) END SEMESTER EXAMINATIONS, NOV 2013
ELECTRONICS AND COMMUNICATION ENGINEERING
THIRD SEMESTER REGULATIONS 2012
EC8353- SIGNALS AND SYSTEMS
(Common to B.E. Biomedical Engineering III Semester)

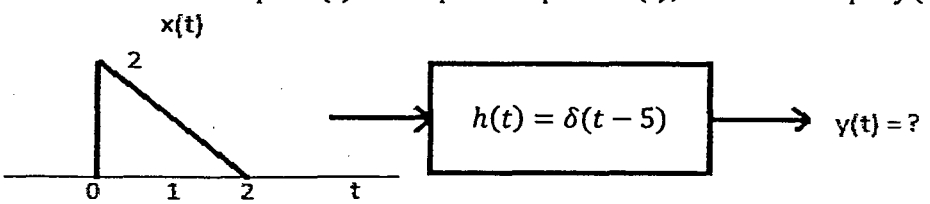
Time: 3 Hours | Answer all the questions | Max. Marks: 100

PART A (10 x 2 =20)

1. Evaluate $\int_{-\infty}^{\infty}\{\delta(t)cos2t + \delta(t-2)e^{-2t}\}dt$.
2. Determine the fundamental time period of the signal $x(t) = \frac{3}{5}cos\left(4t+\frac{\pi}{3}\right)+\frac{8}{3}sin\left(8t+\frac{\pi}{2}\right)$.
3. Find the Fourier Series Coefficients of $x(t) = 2 + \cos 2t + \sin 4t$.
4. For the $x(t)$ shown below, evaluate $\int_{-\infty}^{\infty}X(\omega)d\omega$ and $\int_{-\infty}^{\infty}X(\omega)e^{2j\omega}d\omega$.



5. For the system shown below with input $x(t)$ and impulse response $h(t)$, sketch the output $y(t)$.

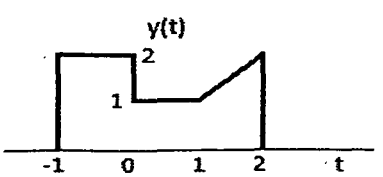


6. The system function of a causal and unstable system s given by $H(s) = \frac{s-1}{(s+1).(s-2)}$. Plot the pole-zero p' along with the region of convergence.
7. State baseband sampling theorem. What do you mean by aliasing?
8. Determine DTFT of $x[n] = u[n-2] - u[n-4]$.
9. $x[n] = \delta[n+1] + \delta[n-1]$. Find $X(z)$ and its RoC.
10. State the conditions for the RoC of causal and stable system function $H(z)$.

PART-B (5 x 16=80)

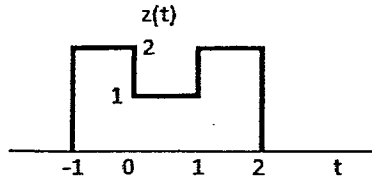
11. (a) Plot the signal $x(t) = 3cos\left(\frac{5\pi}{2}t+\frac{\pi}{2}\right)$. (2)

(b) For the $y(t)$ shown below,



(i) Plot $y(2t)$. (1)
(ii) Plot $y(t+5)$. (1)
(iii) Sketch the signal $y(\frac{2}{3}t-5)$ giving the sequence of transformations in order. (4)

(c) Compute the energy of the signal $z(t)$ shown below. (2)



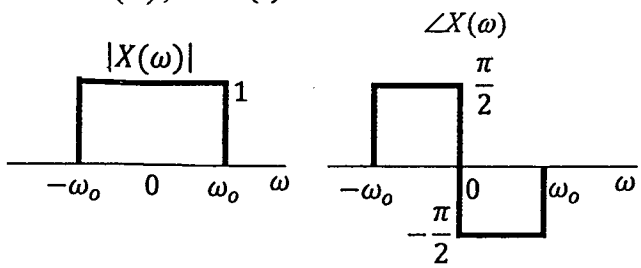
(d) (i) Check if the system $y(t) = 3x^2(t)$ is linear. (2)

(ii) Check if the system $y(t) = te^{3t}$ is time invariant. (2)

(iii) Check if the system $y[n] = \frac{x[n]}{x[n+1]}$ is causal. (2)

2 (a) (i) State and prove scaling property of Fourier Transform. (8)

(ii) Using the plots of $|X(\omega)|$ and $\angle X(\omega)$, find $x(t)$. (8)



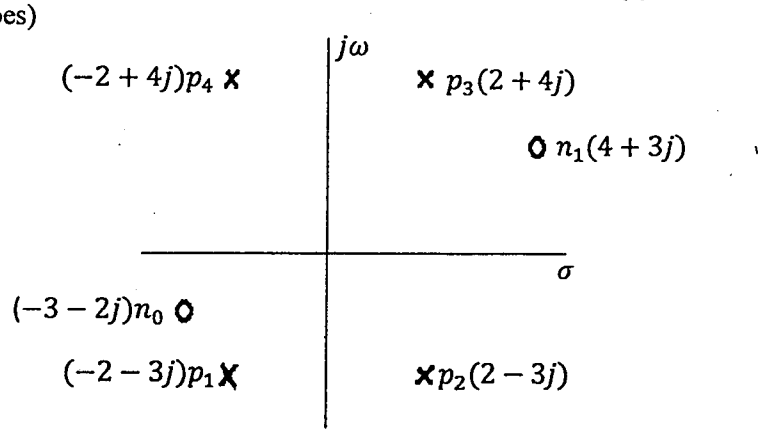
OR

12 (b)(i) What is the relation between Fourier Transform and Laplace Transform? (2)

(ii) Discuss about the properties of RoC of Laplace Transform. (4)

(iii) Find the Laplace Transform of $x(t) = e^{-4t}u(t) + e^{-5t}\sin(5t)u(t)$. (7)

(iv) For the pole-zero plot of $X(s)$ shown in the figure, draw the RoC for $X(s)$ if $x(t)$ is absolutely integrable. (3)
(p_j –poles, n_j- zeroes)



. (a) Consider a causal LTI system described by $\frac{d^2y(t)}{dt^2} + 3\frac{dy(t)}{dt} + 2y(t) = 5\,x(t)$. Then, find

(i) Transfer function H(s) of the system and draw pole-zero plot with RoC (5)

(ii) Impulse response of the system (5)

(iii) Output of the system for the input $x(t) = e^{-2t}u(t)$ (6)

OR

. b) Consider a causal LTI system with $H(\omega) = \frac{1}{j\omega+3}$.

(i) Find the input x(t) for the system produced output $y(t)=e^{-3t}u(t)-e^{-4t}u(t)$. (8)

(ii) Draw the magnitude response $|H(\omega)|$ of the system (4)

(iii) Find the output y(t) for the input x(t)=cos(t) (4)

.(a) (i) Find the DTFT for $x_1[n]=(1/2)^{|n|}$ and use the result of $x_1[n]$ to find the DTFT of $x_2[n]=(n-1)(1/2)^{|n|}$. (8)

(ii) Find the inverse DTFT of $X(e^{j\omega}) = \begin{cases} 2j, & 0 < \omega \le \pi \\ -2j, & \pi < \omega \le 2\pi \end{cases}$ (8)

OR

4.(b) (i) Find the Z-transform of $x[n]=(1/4)^n \cos(\pi n/8)\, u[n]$. Draw pole-zero plot and mark ROC. (8)

(ii) Find x[n] whose Z-transform is $X(z) = \frac{1-\frac{1}{3}z^{-1}}{(1-z^{-1})(1+2z^{-1})}$, if x[n] is (A) right sided, (B) left sided. (8)

5.(a) Let a DT LTI system has transfer function $H(z) = \frac{1-\frac{5}{6}z^{-1}}{\left(1-\frac{1}{4}z^{-1}\right)(1-3z^{-1})}$.

(i) Draw the direct form-II structure of the above system (6)

(ii) Find the impulse response h[n] if the system is causal and comment on its stability (5)

(iii) Find the impulse response h[n] if the system is stable and comment on its causality (5)

OR

5.(b) (i) Find the convolution sum of the two signals $x_1[n]=(3/4)^n\, u[n]$ and $x_2[n]=u[n]$ and plot the resultant signal for n=0,1,2,3,4,5. (8)

(ii) Consider a DT LTI system which produces an output $y[n] =(1/4)^n\, u[n]$ for the input $x[n]=(1/2)^n\, u[n]$. Find the frequency response and impulse response of the system. (8)