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B.E / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2014

ELECTRONICS AND COMMUNICATION ENGINEERING

Semester III

EC8303 Signals and Systems

(R 2012)

Time: 3 Hours | Answer ALL Questions | Max. Marks 100

PART-A (10 x 2 = 20 Marks)

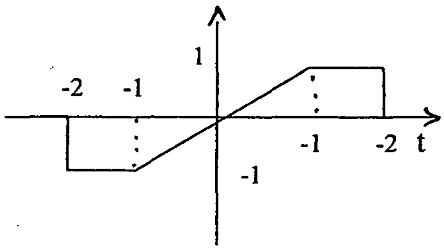
1. Determine the values of P_∞ and E_∞ of the signal $x[n]=(1/2)^n u[n+1]$.

2. Determine whether or not the given signal $x(t)=\cos(2\pi ft+\pi/4)u(t+2)$ is periodic. If periodic determine the fundamental period.

3. Find the time domain signal whose Fourier series co efficient is given by $a_n=j\delta(n-1)-j\delta(n+1)+\delta(n-2)+\delta(n+2), \omega_o=\pi$.

4. State the Dirichlet's conditions for the Fourier transform to exist?

5. Find $x(t)*\delta(t+2)$.



6. Two LTI systems with impulse responses $h_1(t)=u(t)$ and $h_2(t)=u(t-1)$ respectively are connected in parallel. Determine the overall response.

7. Find the DTFT of $\delta(n+3)+\delta(n-3)$

8. What is meant by the term aliasing?

9. A discrete time system has the impulse response of $h[n]=(1/2)^{-n}.u[n]$ .Determine whether or not the system is stable.

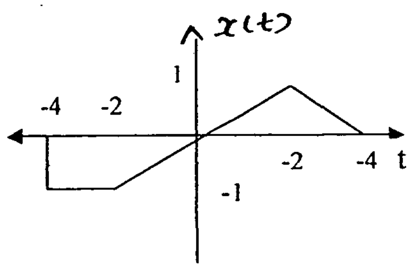
10. Determine the ROC of the given signal $x[n]=(1/4)^n u[n+4]$.

Part – B (5 x 16 = 80 marks)

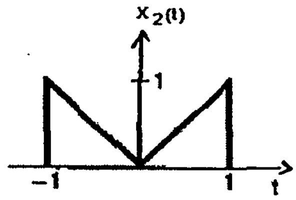
11. i) Determine whether or not the following system is i. Linear ii. Time Invariant iii. Causal iv. Stable (8)

$$y[n]-y[n-1]=x[n]+6x[n-2]$$

ii) Determine x(2t+3),x(-t-2) ,odd and even components of the signal x(t) given in figure given below. (8)



12. a) i) Determine the Fourier transform of the signal $x_2(t)$ given in Figure below , (8)



ii) Find the Inverse Fourier transform of the spectrum $X(\omega)=\begin{cases} 1, & |\omega| < 4 \\ 0, & \text{Otherwise} \end{cases}$ (8)

(OR)

b) i) $X(s)=\dfrac{s+2}{s^2+8s+15}$; $ROC\ -5<\text{Re}\{s\}<-3$. Determine x(t). (6)

ii) Find the Laplace transform of $x(t)=|t|e^{-2|t|}$. Plot pole, zeros and ROC. (10)

13. a) i) The input and output of a causal LTI system described by the following differential equation $\dfrac{d^2y(t)}{dt^2}+7\dfrac{dy(t)}{dt}+12y(t)=2x(t)$. If the input x(t) to the LTI system is given by $x(t)=2e^{-2t}u(t)$, determine the response y(t). (8)

ii) Realize the above system using Direct Form I and Direct Form II. (8)

(OR)

b) i) The signal x(t)=u(t-3)-u(t-6) is fed through an LTI system with an impulse response $h(t)=e^{-3t}u(t)$. Determine the output response. (12)

ii) Determine the output from the above system if the input is the derivative of above input x(t). (4)

14. a) i) Determine the spectrum of $x[n]=a^n u[n]$, $|a|<1$ and plot its magnitude and phase spectrum. (8)

ii) Consider the signal x(t)= cos(2000πt+π/4)+ sin(5500πt) is sampled at the rate twice the Nyquest rate. Plot the spectrum of x(t) and sampled signal. (8)

(OR)

b) i)Consider the signal $x[n]=\left(\frac{1}{3}\right)^n \cos\left(\frac{\Pi n}{4}\right)$, $n \le 0$ (10)

$= 0$, *Otherwise*

Determine the poles and ROC.

ii) Write the properties of ROC of Z transform. (6)

15. a) Consider the discrete time LTI system whose output is $y[n]=\left(\frac{1}{3}\right)^n u[n]$ if the input is $x[n]=\left(\frac{1}{2}\right)^n u[n]$-(1/4)$\left(\frac{1}{3}\right)^n u[n-1]$.

i)Find the impulse response and frequency response. (12)

ii) Find the difference equation that relates the input and output of the above system. (4)

(OR)

b) Consider an LTI system with input x[n] and output y[n] for which

$y[n-1]-\frac{5}{2}y[n]+y[n+1]=x[n]$. The system may or may not be stable or causal.

From the poles and zeros determine the possible choices of impulse responses.
