Registration No :

Total Number of Pages : 02 **B.Tech**
PET3I103

3rd Semester Regular / Back Examination 2018-19
SIGNAL & SYSTEMS
BRANCH : ECE, ETC
Time : 3 Hours
Max Marks : 100
Q.CODE : E938

Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) List the ROC properties of Laplace transform.
b) Find theZ-transform of a sequence $x[n] = \cos(n\omega T)\, u[n]$.
c) Find the Fourier transform of $x(t) = e^{-at}u(t)$
d) Is there be two different signals having same Laplace transform? Give an example. How do you differentiatethese two signals?
e) Define the convolutional integral.
f) What is aliasing?
g) Given $x(n) = \{1, -4, 3, 1, 5, 2\}$. Represent x(n) in terms of weighted shifted impulse function.
h) State the multiplication property of DTFT.
i) Using Z-transform check whether the following system is stable or not?

$$H(z) = \frac{z}{z - 1/2} + \frac{2z}{z + 3}, \quad \frac{1}{2} < |z| < 3$$

j) State and prove the time folding property of Z- transform.

Part- II

Q2 **Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Check the system $y(n) = log_{10}(x|n|)$ is linear, time invariant, causal and static.
b) Find out whether the following signal is energy or power signal or neither any of two. Determine power or energy if found.

$$x(t) = u(t) + 5u(t-1) - 2u(t-2)$$

c) Find the spectrum of $x(t) = e^{-2|t|}$. Plot the spectrum of the signal.
d) Find the Fourier transform of a rectangular pulse with width T and amplitude A.
e) State and prove Parseval's theorem of Fourier Transform.
f) Find the invers Laplace transform of $X(s) = \frac{1}{(s+5)(s-3)}$for the ROC-5<Re{s}<3
g) Using Laplace transform ofx(t). Give the pole-zero plot and find ROC of the signal x(t). $x(t) = e^{-b|t|}$for both b>0 and b<0.
h) Find theZ-transform and sketch the ROC of the following sequence

$$x[n] = 2^n u[n] + 3^n u(-n-1)$$

i) Using the properties of inverse Z-transform solve

$$X(z) = \log(1 + az^{-1})\,; |z| > |a| \; and \; X(z) = \frac{az^{-1}}{(1 - az^{-1})^2}; |z| > |a|$$

j) Determine DTFT of $\left(\frac{1}{2}\right)^n u(n)$. Plot its spectrum.
k) Using convolution property of DTFT, find the inverse DTFT of

$$X(e^{j\omega}) = \frac{1}{(1 - ae^{j\omega})^2}, |a| < 1$$

l) Find the convolution sum of x[n] = r[n] and h[n] = u[n].

Part-III

Long Answer Type Questions (Answer Any Two out of Four)

Q3 Using convolution integral, determine the response of a CTLTI system y(t) given input $x(t) = e^{-\alpha t}u(t)$ and impulse response $h(t) = e^{-\beta t}u(t), |\alpha| < 1, |\beta| < 1$ **(16)**

Q4 Analyze on recursive and non-recursive systems with an example **(16)**

Q5 **(16)**

a) Using graphical method, find the output sequence y[n] of the LTI system whose response h[n] is given and input x[n] is given as follows. x[n] = {0,5,2} and h[n] = {1,1,1}.

b) Consider an analog signal x(t)= 5 cos 200πt.

i. Determine the minimum sampling rate to avoid aliasing.

ii. If sampling rate is 400Hz, What is the DT signal after sampling?

Q6 **(16)**

a) State and prove Sapling Theorem.

b) State and prove following properties of DTFT.

i. Differentiation in frequency

ii. Convolution in frequency domain