Printed pages: 2 **Roll No.** | | | | | | | | | | | **Sub Code: REC303**

Paper ID: 3 0 0 9

B.TECH
(SEM III) THEORY EXAMINATION 2017-18
SIGNAL AND SYSTEM

Time: 3 Hours ***Total Marks: 70***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION - A

Q1. ATTEMPT *ALL* QUESTIONS IN BRIEF. 2 x 7 = 14

a). Check the periodicity of the signals given below. Determine the fundamental time period if signal is periodic:-

$x(t) = sin(10t - 1) - sin(4t - 1)$

b). Find the DTFT of the causal sequence $x(n) = a^n$u(n); $|a| < 1$

c). Check whether the given system are Time Variant and Causal $y(t) = tx(t)$

d). State the convolution property for continuous and discrete time domain signal in z-transform.

e). Determine the Laplace transform & find out ROC for $x(t)=e^{-t}u(t)+e^{-4t}u(t)$

f). Draw the signal x(t)= u(t)- u(t-2).

g).Using final value theorem find final value of signal corresponding to Laplace transform

$$X(s) = \frac{s+1}{s(s+2)(s+8)}$$

SECTION-B

Q2. ATTEMPT ANY THREE PARTS OF THE FOLLOWING (3*7=21)

a). Find and sketch the autocorrelation unction $R_{xx}(\tau)$ for$x(t) = e^{-at}$ u(t), a >0

b). Find the convolution for given sequence

x[n]=1 for n=-2,0,1
2 for n=-1
0 else

and h[n]=δ[n] – δ[n-1] + δ[n-2] – δ[n-3]

c). Find the Fourier transform of the signals given below:-

i) $x(t) = \begin{cases} A, & |t| < T_0 \\ 0, & |t| > T_0 \end{cases}$ ii) x (t)= e^{-at} u (t)

Draw the magnitude and phase response of the transformed signal.

d) If $X(s) = \frac{5s-7}{(s-1)(s+2)}$with$-2 < R\{s\} < -1$. Find x (t)?

e). state and prove sampling theorem and discuss the effect of under sampling.

Q3. ATTEMPT ANY ONE PART OF THE FOLLOWING 7*1=7

a). i). What is signal?Give brief classification of signals.

ii). Prove that power of energy signal is zero over infinite time.

b). Plot $x(t)=u(t) -r(t-1)+ 2r(t-2)-r(t-3)+u(t-4)-2u(t-5)$. Find the even and odd parts of this signal.

Q4. ATTEMPT ANY ONE PARTS OF THE FOLLOWING 7*1=7

a). Determine whether the following continuous time system

$y(t)= x(t) \cos (100\pi t)$ is

i) static or dynamic ii) linear or nonlinear iii) shift variant or shift invariant

iv) causal or noncausal v) stable or unstable.

b). Find energy and power of the signal

i). $x(t)=\cos(t)$ ii)$x(t)=Ae^{-\alpha t} u(t)$, $\alpha>0$

Q5. ATTEMPT ANY ONE PART OF THE FOLLOWING 7*1=7

a). An LTI system with impulse response $h_1(n)$

$$h_1(n) = \left(1/3\right)^n u(n)$$

is connected in parallel with another causal LTI system with impulse response $h_2(n)$. The resulting parallel interconnection has the frequency response.

$$H\left(e^{jw}\right) = \frac{-12 + 5e^{-jw}}{12 - 7e^{-jw} + e^{-2jw}}$$

find the impulse response $h_2(n)$.

b). Find the Fourier transform of the signal $x(t) =e^{-at} u(t)$ and plot is magnitude and phase spectrum.

Q6. ATTEMPT ANYONEPART OF THE FOLLOWING 7*1=7

a). i)Show that if $x_3(t)=ax_1(t)+bx_2(t)$ then$X_3(S)=aX_1(S)+bX_2(S)$

ii) If Laplace transform of x(t) is $(s+2)/(s^2+4s+5)$. Determine Laplace transform of

$y(t)=x(2t-1)u(2t-1)$

b). A causal LTI system is described by difference equation.

$y(n) = y(n-1) +y(n-2) + x(n-1)$

Find the system function H(z) for this system. Plot the poles zeros of H(z) and indicate the region of convergence.

Q7. ATTEMPT ANY ONE PART OF THE FOLLOWING 7*1=7

a). Consider the two continuous-time sinusoidal signals

$x_1(t)=\cos(20\pi t)$ and $x_2(t)=\cos(100\pi t)$

Which are sampled at a rate $f_s=40Hz$. Find the corresponding discrete time signals.

b). Explain system bandwidth and rise time for low pass filter and prove that

$$t_r=0.35/B$$