SEM TRX | SEM-IV | CBSGS | S&S | 22/12/2017

Libr 02

Q.P. Code: 25149

(3 hours) **Total Marks: 80**

(1) Question No. 1 is compulsory.
(2) Solve any three questions from remaining five questions.
(3) Draw neat diagrams and assume suitable data wherever necessary. Justify your assumptions.

Q 1 (a) State and prove the time delay property of Fourier transform. Give the significance of Parseval's relation. **(5 marks)**

(b) Determine the power and energy for the following continuous time signals **(5 marks)**
i) $x(t) = e^{j(2t+\pi/4)}$
ii) $x(t) = 3\cos 5\Omega_0 t$

(c) What is aliasing of frequency spectrum? **(5 marks)**

(d) Verify whether the following continuous time signals are periodic. If periodic, find the fundamental period. **(5 marks)**
i) $x(t) = e^{-(j2\pi t)/7}$
ii) $x(t) = \cos^2(2t - \pi/4)$

Q 2 (a) Determine the response of LTI system governed by the difference equation, $y(n) - 0.5y(n-1) = x(n)$, for input $x(n) = 5^n u(n)$, and initial condition $y(-1) = 2$. **(10 marks)**

(b) Using Laplace transform determine the complete response of the system described by the equation: **(10 marks)**
$d^2y(t)/dt^2 + 5dy(t)/dt + 4y(t) = dx(t)/dt$; $y(0) = 0$; $[dy(t)/dt] = 1$ for $t=0$ for the input $x(t) = e^{-2t} u(t)$.

Q 3 (a) The impulse response of an LTI system is $h(t) = 2e^{-3t}u(t)$. Find the response of the system for the input $x(t) = 2e^{-5t}u(t)$, using Fourier transform. **(10 marks)**

(b) Find the inverse Laplace transform of **(10 marks)**
$X(s) = \dfrac{4}{(s+2)(s+4)}$ if the ROC is
i) $-2 > Re\{s\} > -4$
ii) $Re\{s\} < -4$
iii) $Re\{s\} > -2$

Q-4 (a) What are the all properties of ROC of a rational function of Z **(5 marks)**

(b) A periodic function $x(t)$ is defined as $x(t) = (1-t)^2$; $0 \le t \le T$. Find the Fourier coefficient b_n. **(5 marks)**

(c) Perform the convolution of the given signals using Laplace transform **(5 marks)**
$x_1(t) = e^{-2t} u(t)$
$x_2(t) = e^{-5t} u(t)$

(d) Determine the initial value & final value for the given signal using initial and final value theorems. **(5 marks)**
$X(s) = \dfrac{s+1}{S^2 + 2s + 2}$

Q-5 (a) Using Z transform, determine the response of the LTI system with impulse response $h(n) = 0.4^n u(n)$, for an input $x(n) = 0.2^n u(n)$. **(10 marks)**

(b) The causal system is represented by the following difference equation : **(10 marks)**
$y(n) + \frac{1}{4} y(n-1) = x(n) + \frac{1}{2} x(n-1)$. Find the system transfer function $H(z)$ and the impulse response of the system.

Q-6 (a) The transfer function of an LTI system is $H(z) = \dfrac{Z-1}{(Z-2)(Z+3)}$ **(10 marks)**
Determine the impulse response.

(b) Find $x(n)$, if $X(e^{jw}) = \dfrac{1}{1 - 0.5e^{-jw}}$ **(10 marks)**