Paper / Subject Code: 39706 / SIGNALS AND SYSTEMS

SE | MTRX | Sem-IV | CBSGS | SH-2018 20/12/2018

[Time: 3 Hours] **[Marks 80100]**

Please check whether you have got the right question paper.

N.B:
1. .All Question are compulsory.
2. .Figures to the right indicate full marks.
3. The use of log tables/non programmable calculator is allowed.
4. Answer for use same questions as for as possible should be written together.

Q 1 (a) State & prove time shifting property of Z - Transform. (5 marks)

(b) Test the stability of the LTI systems, whose impulse response are given as : (5 marks)
i) $h(t) = te^{-6t}u(t)$
ii) $h(t) = t \cos u(t)$

(c) State and prove the linearity property of Laplace transform. (5 marks)

(d) Test the causality of the given systems (5 marks)

$$y(t) = x(t) + \int_0^{2t} x(\lambda)d\lambda$$

Q-2 (a) Using Z transform, determine the response of the LTI system with impulse response $h(n) = (0.5)^n u(n)$, for an input $x(n) = (0.3)^n u(n)$. (10 marks)

(b) The causal system is represented by the following difference equation : (10 marks)
$y(n) + 8\,y(n-1) = x(n) + 9\,x(n-1)$. Find the system transfer function H (z) and the impulse response of the system.

Q-3 (a) List and state minimum 5 properties of continuous time Fourier transform (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)
$x_1(t) = tu(t)$
$x_2(t) = e^{-6t}u(t)$

(d) Determine the initial value & final value for the given signal using initial and final value theorems. (5 marks)

$$X(s) = \frac{1}{S(S-1)}$$

Q 4 (a) The impulse response of an LTI system is $h(t) = 2e^{-4t}u(t)$. 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)

$$X(s) = \frac{3}{(s+2)(s+4)}$$ if the ROC is

i) $-2 > Re\{s\} > -4$
ii) $Re\{s\} < -4$
iii) $Re\{s\} > -2$

Q-5 (a) The transfer function of an LTI system is $H(z) = \frac{Z}{(Z-2)(Z+3)}$ (10 marks)

Determine the impulse response.

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

Q 6 (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)
$d^2y(t)/dt^2 + 0.2y(t)/dt + 0.8y(t) = dx(t)/dt$; $y(0) = 0$; $[dy(t)/dt] = 1$ for $t=0$ for the input $x(t) = e^{-2t}u(t)$.