Hall Ticket Number:

Code No. : 13110 ISS

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) III-Semester Main Examinations, December-2017

Introduction to Signals and Systems

Time: 3 hours Max. Marks: 70

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

1. Draw the signal $x(t) = u(t+2) - u(t-3)$.
2. Evaluate the integral $\int_{-\infty}^{\infty}(t-2)^3\,\delta(2t-8)dt$.
3. State the Dirichlet's conditions for the existence of Fourier Transform of signal x(t).
4. Verify the Initial value theorem for the signal $x(t) = 3e^{-5t}$.
5. What is the condition to be satisfied for the Discrete time sinusoidal sequence to be periodic?
6. A Discrete time system is described by $y[n] = x\left[\frac{n}{2}\right]$. Determine whether the given system is Time-invariant or Time variant.
7. The impulse response of the Discrete time LTI system is given by h[n], write the conditions for the system to be Causal and Stable.
8. Define Signal bandwidth and system bandwidth.
9. Find the Z-Transform and ROC of the sequence $x[n] = \delta[n-4]$.
10. If the given sequence x[n] is finite duration anti causal, What is Region of Convergence (ROC).

Part-B (5 × 10 = 50 Marks)

11. a) Conclude whether the given continuous time signal $x(t) = 10\cos(6t)\cos(4t)$ is Energy or Power signal by calculating the Average Power and Energy of the signal. [5]

    b) A continuous time system is described by $y(t) = at^2x(t) + btx(t-4)$, Determine whether the given system is Linear or Non Linear, Time invariant or Time variant. [5]

12. a) State and Prove the Time shifting property of a Fourier Transform. [5]

    b) Find the Inverse Laplace Transform of $X(S) = \frac{S+2}{S^2(S+1)^2}$. [5]

13. a) Define Discrete time Even and Odd signals. Determine the equations for Even and Odd parts of the signal x[n]. [4]

    b) Determine the Nyquist rate of Sampling and Nyquist interval for the band limited signals given below. [6]
    $x(t) = 2\cos(2000\pi t) + 4\sin(6000\pi t)$
    $x(t) = 3\text{sinc}^2(100\pi t)$

14. a) Determine the output y(t) of an LTI system with impulse response $h(t) = 2e^{-4t}u(t)$ for an input $x(t) = e^{-2t}u(t)$ using Convolution Integral. [5]

    b) State and Prove the Frequency Convolution Theorem (Convolution in frequency domain) using Fourier Transform. [5]

Contd... 2

15. a) Determine the Z-Transform of the sequence $x[n] = sin[\omega n]u[n]$. [4]

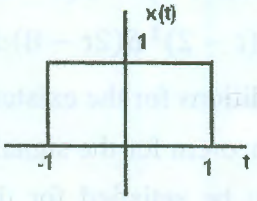
    b) Find the Inverse Z-Transform of $X(Z) = \frac{1+2Z^{-1}+Z^{-2}}{1-\frac{3}{2}Z^{-1}+\frac{1}{2}Z^{-2}}$ if ROC is [6]

    $|Z| > 1$

    $|Z| < \frac{1}{2}$

    $\frac{1}{2} < |Z| < 1$

16. a) For the signal given below generate $x(-2t + 4)$. [5]



    b) If $X(\omega)$ is the spectrum (Fourier Transform) of signal *x(t)* ,Prove that "Magnitude spectrum is Even symmetric and phase spectrum is odd symmetric". [5]

17. Answer any ***two*** of the following:

    a) Generate a Discrete time sequence $x[n] = u[n + 3] + 5u[n - 5] + 4u[n + 10]$. Where $u[n]$ is a unit step sequence? [5]

    b) Write short notes on Distortion less transmission through a system. [5]

    c) State and Prove the Initial value theorem of Z-Transform. [5]