Hall Ticket Number:

Code No. : 21505

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (I.T.) I-Semester (Main) Examinations, December-2015

Signals and Systems

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. State any two properties of Impulse function.
2. Sketch the waveform of the signal given by x(t)=-u(t+3)+2u(t+1)-2u(t-1)+u(t-3).
3. What is causality? What is the condition for causality in terms of impulse response?
4. State the principle of superposition.
5. Define Fourier transform pair.
6. State Parseval's theorem for continuous time signal.
7. What is Quantization?
8. What is the significance of ROC?
9. What is the relation between Discrete Time Fourier Transform (DTFT) and Z Transform?
10. State time shifting property of DTFT.

Part-B (5 X 10=50 Marks)
(All bits carry equal marks)

11. a) Determine whether the following discrete time signal is periodic or not. If the signal is periodic, determine its fundamental period.

$$x(n) = 2\cos\left(\frac{\pi}{4}n\right) + \sin\left(\frac{\pi}{8}n\right) - 2\cos\left(\frac{\pi}{2}n + \frac{\pi}{6}\right)$$

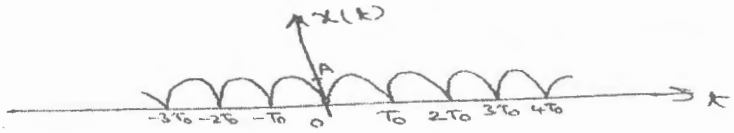
b) Find the convolution of two signals shown in the given figure.

12. a) Determine whether the system described by the equation $6t\frac{dy(t)}{dt} + 7y(t) = x(t)$ with input x(t) and output y(t) is linear and/or time-invariant.

b) Find the equivalent impulse response when two systems represented by $h_1(n) = u(n)$ and $h_2(n) = 3\delta[n-1] + 4\,\delta[n-2]$ are in series.

Contd... 2

13. a) Find the trigonometric Fourier series for the waveform shown in the figure.



b) State and prove the Time shifting and Convolution properties of Fourier transforms.

14. a) Explain the representation of a continuous time signal by its samples and also mention the effects of under sampling.

b) Find the inverse Laplace transform of $X(s) = \frac{1+e^{-2s}}{3s^2+2s}$

15. a) Find the Z-transform of a signal $x[n] = b^{|n|}$ for b>1. Sketch its ROC.

b) Find the DTFT of $x(n) = (0.5)^n u(n) + 2^n u(-n-1)$.

16. a) Find the Energy and Power of the signal x(t) =2cos(4t).

b) Determine whether the discrete time LTI systems represented by the impulse response $h(n) = \left(\frac{-1}{2}\right)^n u(n)$ is stable. Justify your answer.

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

a) Find the Fourier Transform of $x(t) = \begin{Bmatrix} e^{-|t|} & for -2 \le t \le 2 \\ 0 & ; \ otherwise \end{Bmatrix}$

b) Write a MATLAB program to verify sampling theorem.

c) Find the unilateral Z-transform of unit step function.