

Code No: 09A30402

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B.Tech II Year I Semester Examinations, June/July-2014

SIGNALS AND SYSTEMS

(Common to ECE, EIE, BME, ETM, ICE)

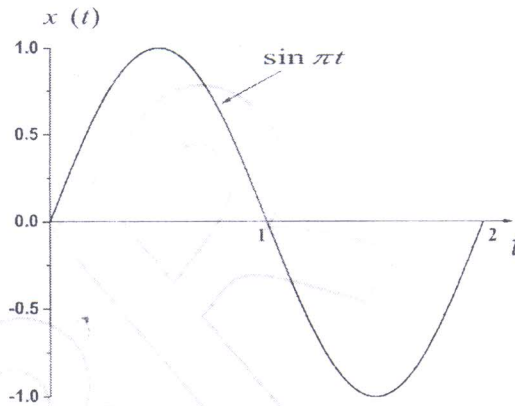
Time: 3 hours

Max. Marks: 75

Answer any five questions  
All questions carry equal marks

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- 1.a) Explain in detail about periodicity properties of Discrete-Time Complex Exponentials and compare with Continuous-Time Exponentials and with required wave forms.
  - b) Explain concepts of Impulse function, Unit step function and Signum function.
- 2.a) Find the exponential Fourier series for the periodic function  $x(t)$  shown in Figure 1.



**Figure: 1**

- b) Explain the Dirchlet conditions in detail with necessary waveforms.
- 3.a) State and prove symmetry and duality properties of Fourier Transform.
  - b) What is Hilbert Transform? Show that a signal and its Hilbert Transform are orthogonal. Find the Hilbert Transform of  $\frac{\sin(t)}{t}$ .
4. Check the five basic system properties (Invertibility, Causality, Stability, Time-invariance, Linearity) for the following systems.
    - a)  $y(t) = \frac{1}{c} \int_{-a}^t x(\tau) d\tau$
    - b)  $y(t) = x^2(t)$
    - c)  $y(t) = \sin[x(t)]$ .
- 5.a) Compute the convolution of  $x(t) = e^{-at} u(t)$ ,  $a > 0$ ,  $h(t) = u(t)$  and sketch each step.
  - b) Show that PSD and auto correlation of a function constitutes a Fourier Transform pair.
- 6.a) Discuss in detail about the generation of finite width samples signals.
  - b) Describe the sample and hold operation with neat sketches. What is its advantage?

- 7.a) Explain the significance of Pole-Zero plot in Laplace domain. How it will help to verify stability of a system?
- b) Find the Laplace transform of the given signal  $x(t) = \begin{cases} e^{-bt} & t \geq 0 \\ 0 & t < 0 \end{cases}$  and plot the Region Of Convergence (ROC).
- 8.a) Represent the Pole Zero pattern of  $x[n] = \begin{cases} a^n, & 0 \leq n \leq N-1, a > 0 \\ 0, & \text{otherwise} \end{cases}$ .
- b) Distinguish between Fourier Transform, Laplace Transform and Z-Transform.

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