Code No: 53021

**R09**

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
### B.Tech II Year I Semester Examinations, May/June - 2015
### SIGNALS AND SYSTEMS
### (Common to ECE, EIE, BME, ETM)

Time: 3 hours

Max. Marks: 75

**Answer any five questions**
**All questions carry equal marks**

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1.a) Verify the following signals $\sin n\omega_0 t$ and $\sin m\omega_0 t$ are orthogonal or not over the interval $(t_0, t_0 + 2/\omega_0)$.
 b) Define the following elementary signals:
 i) Real exponential signal.
 ii) Continuous time version of a sinusoidal signal and bring out the relation between sinusoidal and complex exponential signals. [8+7]

2.a) Expand following function f(t) by trigonometric Fourier series over the interval(0,1). In this interval f(t) is expressed as f(t) = At.
 b) Prove that discrete magnitude spectrum is symmetrical about vertical axis whereas phase spectrum anti-symmetrical about vertical axis. [8+7]

3.a) Find the Fourier transform of symmetrical gate pulse and sketch the spectrum.
 b) State and prove following properties of Fourier transform
 i) Time shifting.
 ii) Differentiation in time domain. [7+8]

4.a) Derive the relationship between rise time and bandwidth.
 b) Sketch the frequency response of ideal LPF, HPF and BPF. [8+7]

5.a) Prove that the correlation and convolution functions are identical for even signals.
 b) Show that the auto-correlation function at the origin is equal to the energy of the function. [8+7]

6.a) State and prove sampling theorem for band limited signals using analytical approach.
 b) Give introduction to band pass sampling. [8+7]

7.a) Find Laplace transforms and sketches their ROC of:
 i) x(t) = u(t-5)
 ii) $x(t) = e^{j\omega t} u(t)$
 b) Find the inverse Laplace transform of:
 X(s) = (-5s-7)/(s+1)(s-1)(s+2). [8+7]

8.a) Determine z - transform, pole - zero locations and sketch the ROC of following signal $x(n) = -u(-n-1) + (1/2)^n u(n)$.
 b) Find the inverse z - transform of $X(z) = (2+z^{-1})/(1-0.5 z^{-1})$ with ROC $|z|>\frac{1}{2}$ using power series expansion. [7+8]

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