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| R07 |
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**Code: R7210404**

B.Tech II Year I Semester (R07) Supplementary Examinations, May 2013

**SIGNALS AND SYSTEMS**  
(Common to ECE, EIE and E.Con.E)

Time: 3 hours

Max. Marks: 80

Answer any FIVE questions  
All questions carry equal marks

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- Verify the following signals  $\cos n\omega_0 t$  and  $\sin m\omega_0 t$  are orthogonal or not over the interval  $((t_0, t_0 + 2/\omega_0))$ .
  - Explain:
    - How signum function is expressed in terms of unit step function?
    - How step function is expressed in terms of impulse?
    - How impulse function is expressed in terms of step?
- Expand following function  $f(t)$  by exponential Fourier series over the interval (0.2). In this interval  $f(t)$  is expressed as  $f(t) = At$ .
  - Prove that discrete magnitude spectrum is symmetrical about vertical axis whereas phase spectrum anti-symmetrical about vertical axis.
- Find the Fourier transform periodic impulse train.
  - Find Fourier transform of  $\sin \omega_0 t$ .
- Derive the relationship between system bandwidth and signal rise time.
  - Sketch and explain the frequency response of ideal LPF, HPF, BPF and BRF.
- Derive the expression for power in frequency domain.
  - Find the auto correlation of  $f(t) \cos \omega_0 t$  and sketch.
- Sketch the spectrum of naturally sampled signal for following cases:
    - $\omega_0 = 2 \omega_m$ .
    - $\omega_0 > 2 \omega_m$ .
    - $\omega_0 < 2 \omega_m$ .
 Where ' $\omega_0$ ' is frequency corresponding to sampling interval and ' $\omega_m$ ' is maximum frequency in the spectrum of base band signal. Explain the each sketch.
  - Explain how original signal can be recovered from sampled signal.
- For the signal given below and check the possibility of finding Laplace transform by sketching ROC .  

$$x(t) = e^{-t}u(t) + e^{-2t}u(-t).$$
  - Find the inverse Laplace transform of:  

$$x(s) = 4s^2 + 15s + 8/(s + 2)^2(s + 1)$$
 Assuming signal is causal.
- Determine z-transform, pole zero locations and sketch of ROC of following signal:  

$$x(n) = -u(-n - 1) + (1/5)^n u(n).$$
  - Find the inverse z-transform of:  

$$x(z) = (2 + z^{-1})/(1 - 0.2z^{-1})$$
 with ROC  $|z| > 1/5$   
 Using power series expansion.

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