

R07

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

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

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

$$x(n) = -u(-n - 1) + (1/5)^n u(n).$$
 (b) 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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