

FACULTY OF ENGINEERING
B.E. 2/4 (ECE) II Semester (Main) Examination, May/June 2011
SIGNAL ANALYSIS AND TRANSFORM TECHNIQUES

Time : 3 Hours]

[Max. Marks : 75

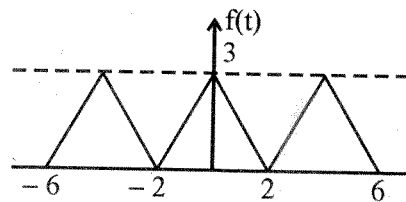
Note : Answer **all** questions from Part – A. Answer any **five** questions from Part – B.

PART – A**(Marks : 25)**

1. Test whether the ramp function is energy signal or power signal.
2. The signal $f(t) = 3t$ for $0 \leq t \leq 4$ and is periodic with period 4. What are the harmonics present ?
3. If the Fourier transform of $f(t)$ is $F(w)$, what is the Fourier transform of $f(at)$?
4. Define the Bandwidth of a signal.
5. State the condition in terms of impulse response for a system to be causal.
6. What is the FT of a unit step function ?
7. For a left sided sequence $x(n)$, draw the ROC in the z-plane.
8. If the z-transform of a sequence is $x(z)$, what is the z-transform of $nx(n)$?
9. What is the relation between convolution and correlation ?
10. State the properties of cross correlation.

PART – B**(Marks : 50)**

11. (a) Derive the expressions for the Fourier series coefficients.
- (b) For the periodic waveform shown in Fig.(1) determine the Fourier series coefficients.

**Fig. (1)**

12. (a) Find the FT of the signal $f(t) = te^{-at} u(t)$.
- (b) State and prove Parseval's theorem of FT.

13. (a) State and prove scaling property of L-transform.
(b) If the L-transform of $x(t)$ is $X(s) = \frac{4}{(s+2)^2}$, find the L-transform of $g(t) = x(2t-2)$.
14. (a) Find the inverse L-transform of $X(s) = \frac{4(s+1)}{s^2+2s+2}$
(b) The transfer function of a system is $1 + (s) = \frac{s+2}{(s+3)(s+4)^2}$
Sketch the pole-zero plot and test the stability of the system.
15. (a) Find the z-transform and the ROC for the sequence, $x(n) = 0.8^n u(n)$.
(b) State and prove convolution property of z-transform.
16. (a) Find the inverse z-transform of $x(z) = \frac{z+1}{(z+0.2)(z-0.6)}$
(b) For the system given by the difference equation, draw the canonical form realization diagram.
 $y(n) + 0.5y(n-1) + 2y(n-2) + 3y(n-3) + 0.8y(n-4) = 3x(n) + 5x(n-2)$.
17. (a) State and prove the properties of auto correlation.
(b) Compute the convolution of $h(t)$ and $x(t)$ where $h(t) = e^{-\alpha t} u(t)$,
 $x(t) = e^{\alpha t} u(-t)$ and $\alpha > 0$.