Signals and Systems
(EC-206, Dec-2007)

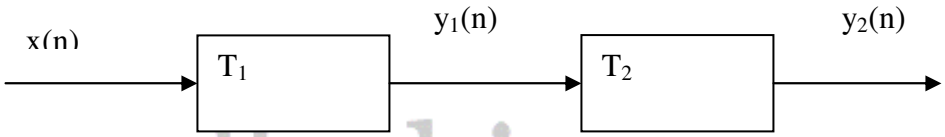
Note: Section A is compulsory. Attempt any four questions from Section-B and any two from Section-C.

Section-A

1. a) What do you mean by Fourier and inverse Fourier transforms?
   b) Define Nyquist rate.
   c) What do you mean by correlation and how do you classify it?
   d) Define stable and unstable system.
   e) What do you understand from joint and conditional probability?
   f) Define noise equivalent bandwidth.
   g) Test the periodicity of $y(t) = \cos^2 t$.
   h) Distinguish between energy and power signal.
   i) Define probability density function.
   j) Show that $\delta(n) = n(n) - u(n-1)$

Section-B

2. Two systems connected in cascade shown in figure.



Show that $T_C = T_1 T_2$ and verify also whether T_C is shift invariant or not if T_1 and T_2 are shift invariant.

3. The probability density function for a random variable X is given by $f(x) = x/10$ for $x = 1, 2, 3,$ 4. Write out tha probability distribution of X as a table and calculate the probability that X is less than 3, $P(X<3)$.
4. Write a note on
   (a) Thermal noise (b) Shot noise
5. What are the properties of Fourier transform. Prove each property.
6. Derive Parseval's relation for periodic signal.

Section-C

7. Write a note on:
   (a) Random events (b) Random variables (c) Random process
   (d) Guassian pdf (e) Eygodicity
8. Derive an expression for noise in an envelope detector.
9. (a) Prove the following
   (i) $r_{xy}(1) = r_{yx}(-1)$ (ii) $r_{xy}(1) = x(1)*y(-1)$
   (b) Obtain the Fourier series for the waveform shown in figure.