Minor I — **Communication Systems (EEL306)** — IInd Sem 2012-13

Max Marks: 50 — Duration: 1 hour

**Note:** All questions carry equal marks

**Q1.**

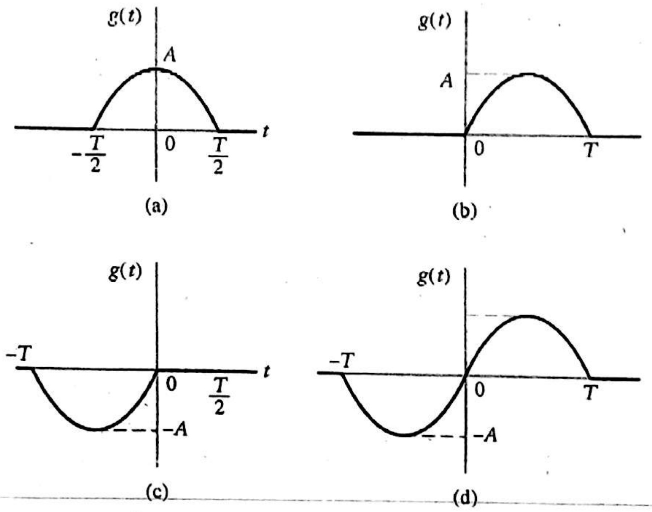
Evaluate the inverse Fourier transform $g(t)$ of the one-sided frequency function

$$G(f) = \begin{cases} \exp(-f), & f > 0 \\ \frac{1}{2}, & f = 0 \\ 0, & f < 0 \end{cases}$$

Hence, show that $g(t)$ is complex, and that its real and imaginary parts constitute a Hilbert-transform pair.

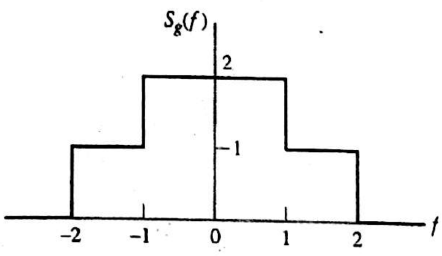
**Q2.**

Find the Fourier Transform of each of the signals shown in the following figure




**Q3.**

Find the autocorrelation function of a power signal $g(t)$ whose power spectral density is depicted in the following figure

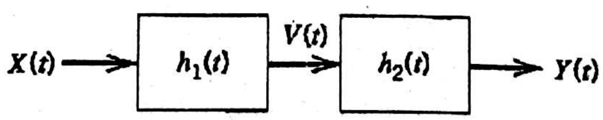



**Q4.**

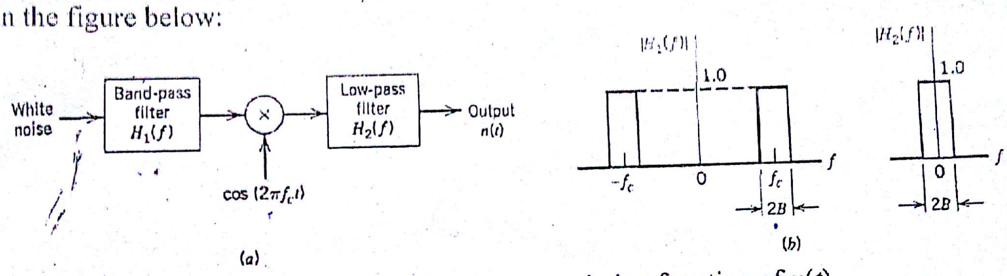
Consider two linear filter connected in cascade. Let $X(t)$ be a stationary process with autocorrelation function $R_X(\tau)$.

(a) Find the autocorrelation function of $Y(t)$.

(b) Find the cross-correlation function $R_{VY}(\tau)$



Q5.
White Gaussian noise of zero mean and power spectral density $N_0/2$ is applied to the filtering scheme shown in the figure below:




(a) Find the powers spectral density of and autocorrelation function of $n(t)$
(b) Find the mean and variance of $n(t)$