National Institute of Technology Hamirpur
Communication Engineering (CSD-315)

Note: All five questions are compulsory and carry equal marks. Write answers of sub-parts of each question in continuation only.

Maximum time: 1.5 Hours.

- Q1. Compute the power of signal $g(t) = C_1 \cos(\omega_1 t + \theta_1) + C_1 \cos(\omega_1 t + \theta_1)$, (a) if $\omega_1 \neq \omega_2$, (b) if $\omega_1 = \omega_2$, and (c) if $\omega_1 = \omega_2 = 0$.
- Q2. Compute the Fourier transform of the signals (a) $e^{-\pi t^2}$, (b) $\sum_{m=\infty}^{\infty} \delta(t - mT)$, $f_0 = \frac{1}{T}$, and (c) $e^{-at} \cos(2\pi f_0 t) u(t)$, where $a > 0$ and $u(t)$ is unit step function.
- Q3. Define the kernel of Hilbert transform (HT) and obtain its Fourier transform. Prove that Hilbert transform is a special case of the phase transform. Show that HT of $\cos(\omega t)$ is $\sin(\omega t)$.
- Q4. For the baseband signal $m(t) = \cos(1000\pi t)$ obtain the following: Sketch the spectrum of $m(t)$, Sketch the spectrum of double-sideband suppressed carrier (DSB-SC) signal $m(t)\cos(10000\pi t)$, compute the power of DSB-SC signal, identify the upper sideband (USB) and the lower sideband (LSB) spectra.
- Q5. For the baseband signal $m(t) = \cos(100\pi t)$, obtain the double-sideband with carrier (DSB-WC) signal where carrier is $\cos(1000\pi t)$, Sketch the spectrum of DSB-WC signal, compute modulation index, power and efficiency of the DSB-WC signal.
