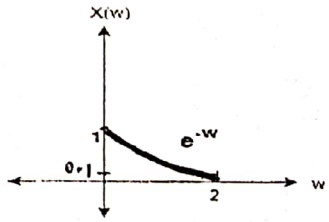
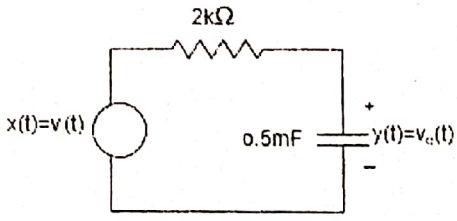
PUNJAB ENGINEERING COLLEGE, CHANDIGARH

Mid-term Examination (19201)

Programme: B.Tech. (ECE) | **Semester: 3rd**

Course Name: Signals and Systems | **Time Allowed: 90 min**

Course Code: ECN 202 | **Maximum Marks: 40**

Q. No		Marks
1.	(a) If the input output relation of a system is given by difference equation $y[n] = x[-0.5n + 3]$ and the input signal x[n] is given by $x[n] = \{1,3,5,7\}$, then evaluate the output $y[n]$ of the system. (b) Find whether this system is a causal system.	3 2
2.	What is the difference between an energy signal and a power signal? Find whether a unit step signal is an energy signal or a power signal. Find its energy or power.	4
3.	Step response of a continuous time system is given by $s(t) = (5 - 4e^{-2t})u(t)$. Find the response of the system input δ (t), where δ(t) is unit impulse signal.	3
4.	(a) A discrete time LTI system having impulse response $h(n) = \left(\frac{1}{5}\right)^n u(n)$ is given an input $x(n) = 3\left(\frac{1}{5}\right)^{n+1} u(n)$. Find the output y(t) of this system using convolution sum? (b) Hence find DTFT of y(t). Mention the properties used, if any. (c) For the same system, verify the convolution property of DTFT.	4 4 4
5.	(a) State and prove the frequency shifting property of Fourier transform. (b) Hence, Find the inverse Fourier transform of signal $X(\omega) = e^{-\omega}$ $for\ 0 \leq \omega \leq 2$, as shown in figure. 	3 4
6.	The following RC low pass filter is given an input x(t), having a power spectral density of K, where K is constant. Find the power of output y(t) if transfer function of RC low pass filter is given by $\frac{1}{1+j\omega RC}$ 	4
7.	Find the autocorrelation function of the signal $x(t) = e^{3t} u(-t)$.	5

PUNJAB ENGINEERING COLLEGE, CHANDIGARH

End-Term Examination

November 2019

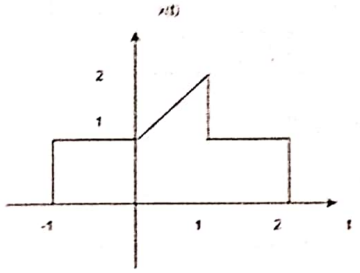
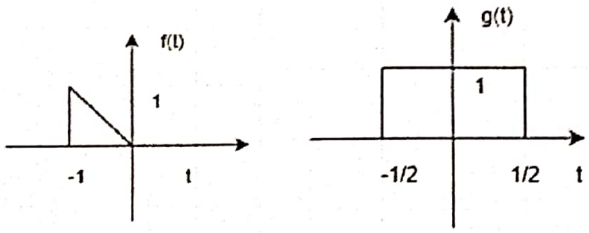
Program: **B. Tech.** Year/Semester: **2nd /3rd sem**

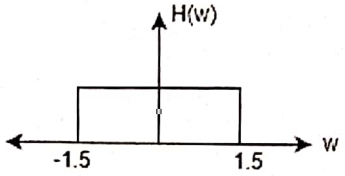
Course Name: **Signals and systems** Course Code: **ECN 202**

Maximum Marks: **60** Time Allowed: **3 Hours**

Note: 1. All questions are compulsory.

2. Unless stated otherwise, the symbols have their usual meanings in context with subject.

S.no.		Marks
1.	(a) Output $V_o(t)$ of a square law demodulator is given by $V_o(t) = k_1 V_i(t) + k_2 V_i^2(t)$, where $V_i(t)$ is input of square law device and k_1 and k_2 are constants. Determine whether this system is an LTI system or not? (b) Express the signal given in figure as sum of shifted, scaled or reversed step signals and ramp signals. 	3 3
2.	(a) How can the concept of convolution be used to multiply two polynomials? Explain with an example. (b) Verify the commutative property of convolution for the two signals $x_1(t) = e^{-3t}u(t)$ and $x_2(t) = u(t+3)$.	4 5
3.	(a) For a signal $x(t) = sin2t$, find its Hilbert transform $\hat{x}(t)$. (b) Hence, find the Fourier transform of x(t) and $\hat{x}(t)$ and compare their magnitude and phase spectra.	3 4
4.	(a) Express g(t) as sum of shifted, scaled or reversed signal f(t), for f(t) and g(t) shown in figure. (b) Find Fourier transform of g(t) in terms of F(w), if g(t)↔G(w) and f(t)↔F(w) are Fourier transform pairs. 	3 3

5.	Input-Output relation of a system is given by difference equation $y[n] - \frac{1}{2}y[n-1] = 2x[n]$. (a) Find transfer function H(z) of the system. (b) Hence, find the impulse response of the system if the system is a causal as well as a stable system. (c) Draw the block diagram implementation of the system.	 3 3 3
6.	(a) The frequency response of an ideal low pass digital filter $H(\omega)$, having cutoff frequency 1.5rad/sec is shown in figure over one period. Find its impulse response h(n).  (b) In a series RL circuit, if input voltage is constant voltage source, which has been switched on at t=0, then find current, i(t), passing through the inductor. Assume all initial conditions to be zero.	4 4
7.	Find energy of following signal, $x(t) = \frac{sin^2 t}{t}$ using the concept of ESD.	5
8.	(a) Discuss the relationship between average information and Entropy of a system using examples. (b) Find the maximum allowable information rate for error free transmission in a channel, if the channel is having usable bandwidth of 5kHz and SNR 40 dB . (c) Why do we use variable length coding techniques. Obtain the redundancy in Huffman code for a discrete source with five symbols, having probabilities 0.55, 0.15, 0.15, 0.10, 0.05 respectively.	3 2 5