Roll No:.............................

Thapar University, Patiala
Department of Electronics & Communication Engineering

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B. E. (Second Year): Semester-III (ECE)	Course Code: <mark>UEC404</mark>
	Course Name: Signals and Systems
September 25, 2017	Monday, 3.30 to 5.30 p.m.
Time: 2 Hours, M. Marks: 48	Name of Faculty: US, NS, SP, SK, MK

Note: **Attempt all five (05) questions**
      Assume missing data, if any, suitably

Q.1 (a)	A continuous time signal $x(t)$ is shown below. Sketch and label carefully the signals i) x (2-t) ii) x(2t+1) 	(4)
Q.1 (b)	Determine whether the given signal $x(n)$ is periodic or aperiodic. If it is periodic, calculate the time period of the signal. $$x(n)=1 + e^{j2\pi n/3} - e^{j4\pi n/7}$$	(4)

Q.2 (a)	Check whether the following statements are true or false
	   i) The series interconnection of two linear time-invariant systems is itself a linear time-invariant system.
	   ii) The series interconnection of two nonlinear systems is itself nonlinear.
	Justify your answer.
		(4)

Q.2 (b)	Find the linearity, time invariance and causality of the system given by $$y(n)=x(n^2) + x(-n)$$	(3)
Q.3 (a)	Suppose that the unit impulse response of an LTI system is a unit ramp given by $$h(n)=r(n)=nu(n)$$ Compute the response of the system if the input to system is $x(n)=u(n)$	(4)
Q.3 (b)	Let $x(t) = u(t-3) - u(t-5) \ and \ h(t) = e^{-3t} u(t)$ Compute $y(t) = x(t) * h(t)$	(6)
Q.4 (a)	Determine whether the given system is causal and/or stable. Justify your answer. $$h(n) = (-1/2)^n u(n) + (1.01)^n u(n-1)$$	(3)
Q. 4 (b)	Consider the following interconnection of LTI systems $h_1(t)$ and $h_2(t)$.	(6)

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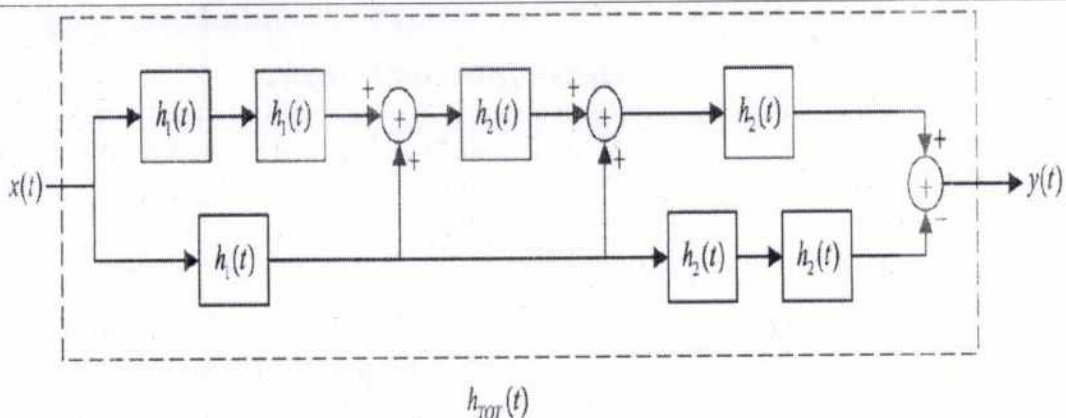
$$h_{TOT}(t)$$

i) Express the overall system response $h_{TOT}(t)$ in terms of the impulse responses $h_1(t)$ and $h_2(t)$.

ii) Assume that system 1 is the inverse of system 2, so that $h_1(t) * h_2(t) = \delta(t)$. Simplify your answer to (i).

iii) From your answer in (ii), what is the purpose of the overall system?

Q.5 (a)	A continuous time periodic signal x(t) is real valued and has a fundamental period T=8. The non-zero Fourier series coefficients for x(t) are given as $$a_1 = a_{-1}^* = j \qquad a_5 = a_{-5} = 2$$ Express x(t) in the form $$x(t) = \sum_{k=0}^{\infty} A_k \cos(w_k t + \varphi_k)$$	(7)
Q.5 (b)	Determine the Fourier series representation for the signal shown below. Also plot the spectrum.	(7)