Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, December 2024

Course: Signals and Systems **Semester: III**

Program: B.Tech E&C **Time : 03 hrs.**

Course Code: ECEG2045 **Max. Marks: 100**

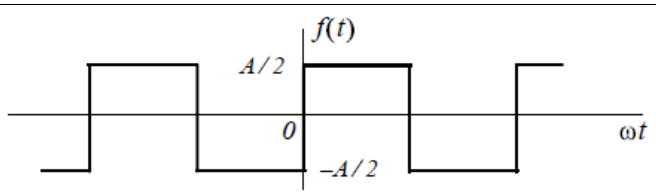
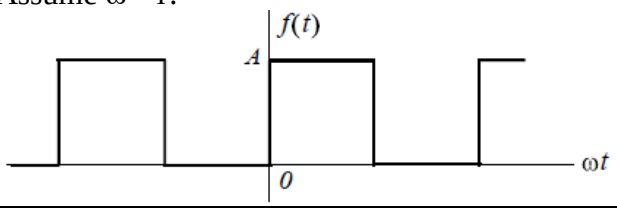
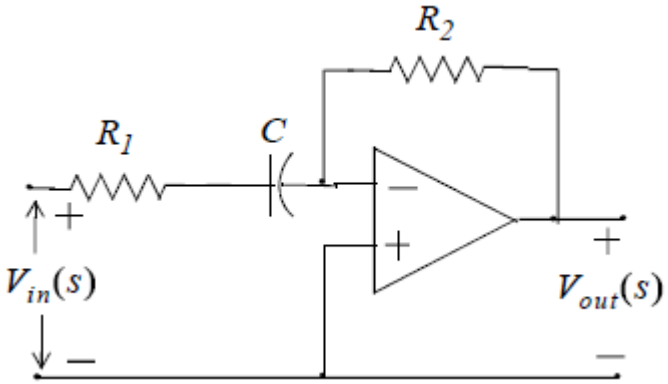
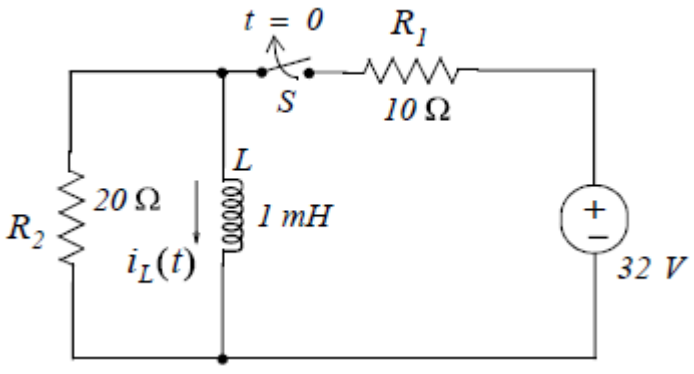
Instructions: Read all the questions carefully. You can do it. All the best!

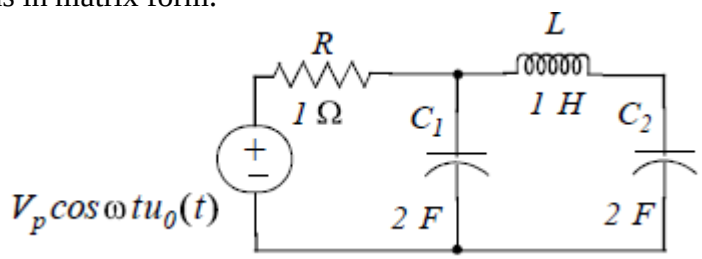
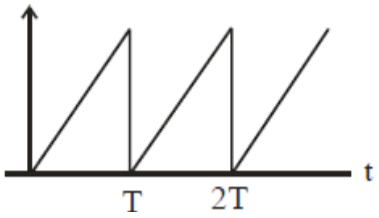
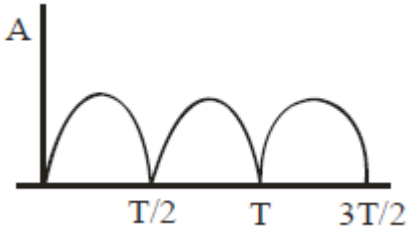
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Use the Initial Value Theorem to find x(0) given that the Laplace transform of x(t) is $(2s + 3) / (s^2 + 4.25s + 1)$	**4**	**CO2**
Q 2	Use the partial fraction expansion method to compute the Inverse Z transform of $$F(z) = \frac{1 + 2z^{-1} + z^{-3}}{(1 - z^{-1})(1 - 0.5z^{-1})}$$	**4**	**CO2**
Q 3	If 'a' is a real constant, and F(ω) is the Fourier transform of f(t), then prove, $$f(at) \Leftrightarrow \frac{1}{\lvert a \rvert} F\left(\frac{\omega}{a}\right)$$	**4**	**CO2**
Q 4	For the signals x(t) = u(t) and y(t) = u(t), determine the convolution result of x(t)*y(t).	**4**	**CO2**
Q 5	Find the Laplace transform of the following time domain functions: a) 12 b) 6 u(t) c) 24 u(t-12) d) 5 t u(t)	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Compute the first 5 components of the exponential Fourier series for the waveform. Assume ω =1.	**10**	**CO3**

	 OR Compute the first 5 components of the exponential Fourier series for the waveform. Assume ω =1. 		
Q 7	Derive the transfer function for the network shown below. 	**10**	**CO3**
Q 8	Derive the Fourier transform of x(t) = A [u (t + 3T) – u (t + T) + u (t - T) – u (t - 3T)]	**10**	**CO3**
Q 9	In the circuit, switch S has been closed for a long time and opens at t=0. Use the Laplace transform method to compute $i_L(t)$ for t>0. 	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q 10	Calculate the Z-Transform of the following signals & draw its ROC. a) Unit Impulse b) Unit Ramp c) Unit Step d) Sgnm OR In the circuit shown below, all initial conditions are zero. Write state equations in matrix form.  	**20**	**CO4**
Q 11	Find Laplace Transform of the following periodic waveforms. (a)  (b)  	**20**	**CO4**