Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2023

Course: Signals and Systems **Semester: IV**
Program: B. Tech Electrical Engg. **Time : 03 hrs.**
Course Code: ECEG 2045 **Max. Marks: 100**

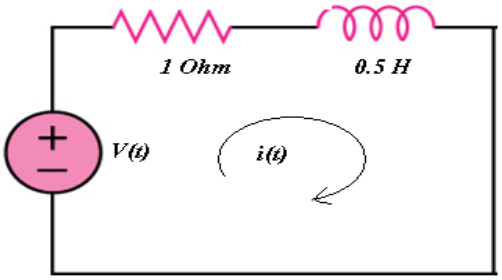
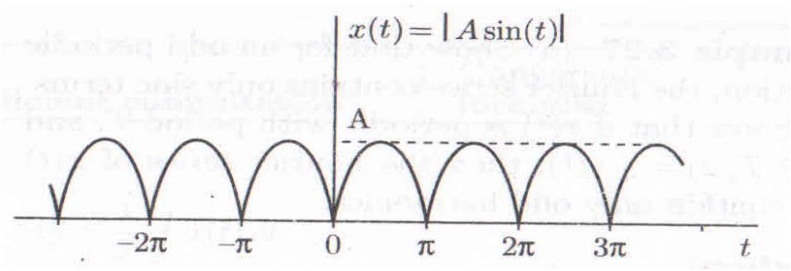
Instructions:

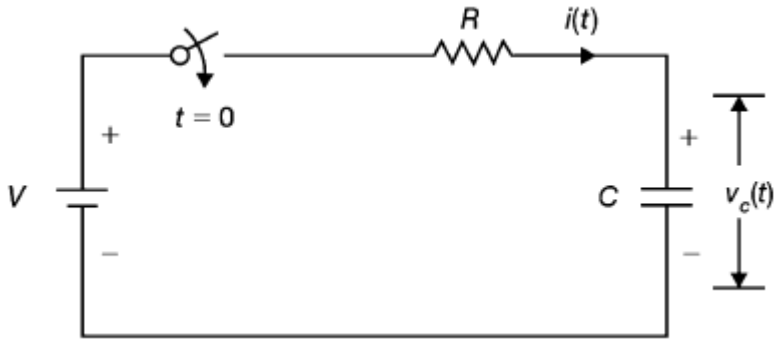
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	The signals $x_1(t) = 10\cos(100\pi t)$ and $x_2(t) = 10\cos(50\pi t)$ are both sampled with f_s = 75 Hz. Show that the two sequences of samples so obtained are identical.	**4**	**CO1**
Q 2	Explain the following signals with the neat sketches (i)Unit step (ii)Unit ramp (iii)Unit impulse (iv)Exponential (v)Even and odd	**4**	**CO1**
Q 3	Determine and sketch the magnitude and phase response of the LTI causal system described by the differential equations $\frac{dy(t)}{dt} + y(t) = \frac{dx(t)}{dt} - x(t)$	**4**	**CO2**
Q 4	What is the relation between laplace transform and fourier transform?	**4**	**CO2**
Q 5	What is the condition for Z Transform the exist?	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Find (a) bilateral Laplace transform and (b) unilateral transform of the signal $x(t) = e^{-a(t+1)}u(t+1)$	**10**	**CO3**

Q 7	Use the Laplace transform method for determining i(t) in the below shown figure, t≥0.Assume that the current i(t) through the inductor at t=0 is 2 amperes. and v(t)=$e^{-t}u(t)$  	**10**	**CO3**
Q 8	Find the exponential Fourier series and sketch the corresponding Fourier spectrum Xn versus w for the full-wave rectified sine wave as shown. .  	**10**	**CO2**
Q 9	Determine whether the following signals are power or energy signals or neither. (a) x(t)= $e^{-a\lvert t\rvert}$ (b) $nu(n)$ **OR** Determine the z transform of the anticausal signal x(n) = a^n u (-n-1) and depict the ROC and the locations of poles and zeros in the z plane.	**10** **10**	**CO1**
SECTION-C (2Qx20M=40 Marks)			
Q 10	A causal discrete time LTI system is described by $y(n)-\frac{3}{4}y(n-1)+\frac{1}{8}y(n-2)=x(n)$ Where x(n) and y(n) are the input and output of the system, respectively (a) Determine the system function H(z) for a causal system function. (b) Find the impulse response h(n) of the system.	**20**	**CO2**

	(c) Find the step response of the system		
Q 11	An LTI system is characterized by the system function $$H(z)=\frac{3-4z^{-1}}{1-3.5z^{-1}+1.5z^{-2}}$$ Specify the ROC of H(z) and determine h (n) for the following conditions: (a) The system is causal and unstable (b) The system is noncausal and stable **OR** Find the response of the circuit as shown in figure 1 for the input X(t) = r(t) – 2r(t-1) + r(t-2)  Figure 1	**20** **20**	**CO4** **CO3**