U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

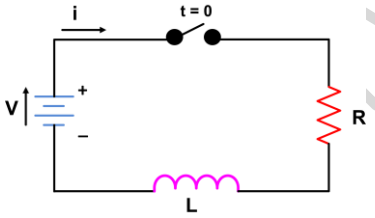
Autonomous Institute Affiliated to VTU

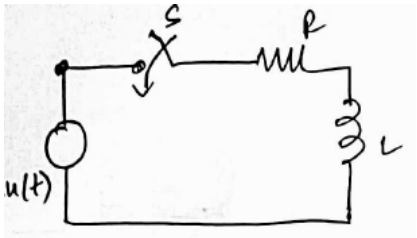
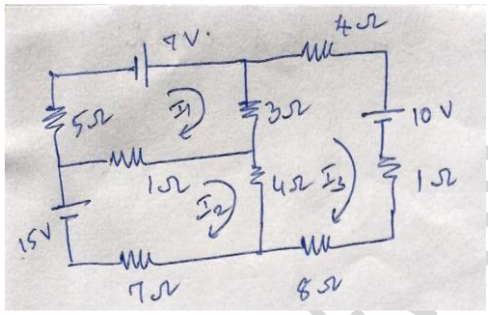
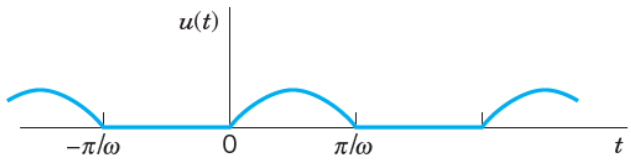
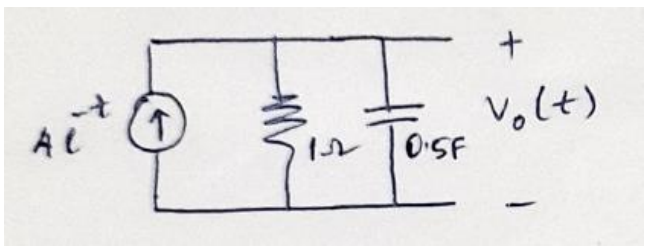
August 2024 Semester End Main Examinations

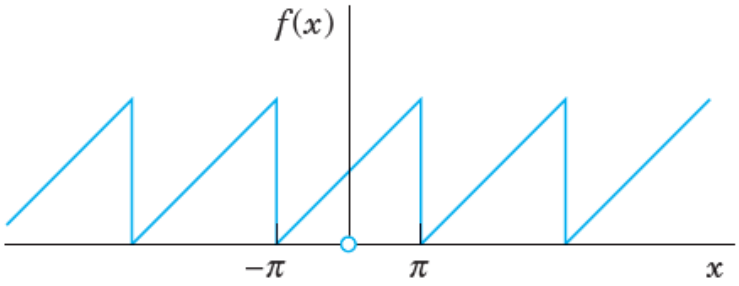
Programme: B.E. **Semester: IV**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 23EE4BSMAE **Max Marks: 100**
Course: Mathematical Applications to Electrical Systems

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			CO	PO	Marks
		UNIT - I			
1	a)	Solve for q(t) for an RC series circuit supplied with a voltage source of 50 V using Eulers method. Construct a table with five values. R= 10 Ω, C= 1 μF, Step size = 0.1.	*CO1*	*PO1*	**07**
	b)	Find the solution of IVP, y'=x+y, y(0)=0 from 0.2 to 1 with a step size of 0.2.	*CO2*	*PO3*	**07**
	c)	Consider an RL circuit with a source voltage V = 100 V and initial current I(0) = 0. Find the current I(t) for t ≥ 0 using Bernoulli equation when, R = 50 Ω ; L = 1 H. 	*CO2*	*PO3*	**06**
		UNIT - II			
2	a)	A series circuit consists of R= 20 Ω, L= 1H, C= 0.002F, E= 12Sin 10t. The initial charge and current are 0. Find the charge and current at t>0.	*CO2*	*PO3*	**10**
	b)	Briefly explain the method of undetermined coefficients to solve nonhomogeneous ODE.	*CO1*	*PO1*	**10**
		OR			
3	a)	Solve the IVP $y''+3y'+2.25y=-10e^{-1.5x}$. Given y(0)=1, y′ (0)=0	*CO2*	*PO3*	**10**
	b)	Derive the equation for general solution of Euler Cauchy equation when the roots are complex conjugate.	*CO1*	*PO1*	**10**
		UNIT - III			
4	a)	Find Laplace transform of e^{at} and $e^{at}\cos\omega t$.	*CO1*	*PO1*	**06**
	b)	Solve the initial value problem using Laplace Transform: y″-y=t, y(0)=1, y′ (0)=1.	*CO2*	*PO3*	**07**

		c)	For the circuit shown, find the expression for current when the switch is closed at t=0. The circuit is excited by unit step input. Assume zero initial current. 	*CO2*	*PO3*	**07**
			UNIT - IV			
	5	a)	Solve the linear system given by its augmented matrix. $$\begin{aligned} 10x + 4y - 2z &= -4 \\ -3w - 17x + y + 2z &= 2 \\ w + x + y &= 6 \\ 8w - 34x + 16y - 10z &= 4 \end{aligned}$$	*CO2*	*PO3*	**10**
		b)	Find Eigen values and Eigen vectors for the circuit shown. 	*CO2*	*PO3*	**10**
			UNIT - V			
	6	a)	Obtain Fourier series for the output of a half wave rectifier circuit which clips the negative portion of the input sinusoidal wave ESinωt. $$u(t) = \begin{cases} 0 & \text{if} \quad -L < t < 0, \\ E \sin \omega t & \text{if} \quad 0 < t < L \end{cases}$$ 	*CO2*	*PO3*	**10**
		b)	Find the voltage V_0 in the circuit shown using Fourier Transform method. 	*CO2*	*PO3*	**10**

			OR			
	7	a)	Find the Fourier series of the function f (x) = x + π if -π < x < π 	*CO1*	*PO1*	**10**
		b)	Obtain 4 point DFT of the sequence x(n)= {1,2,2,1}	*CO2*	*PO3*	**10**

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