U.S.N.										

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

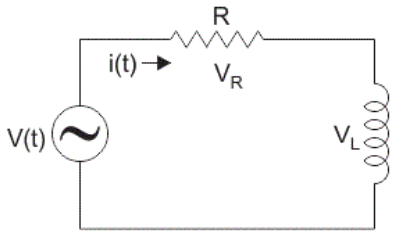
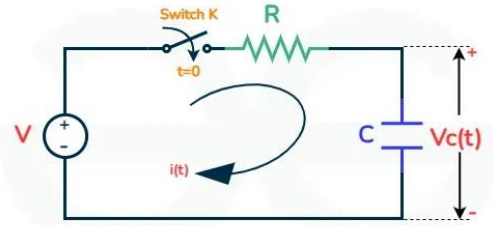
Autonomous Institute Affiliated to VTU

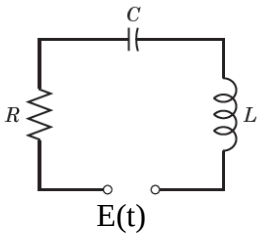
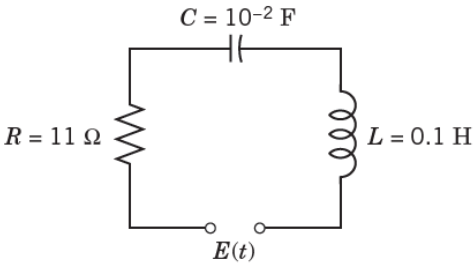
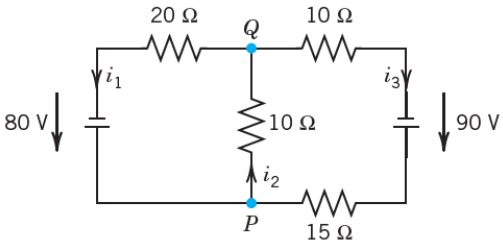
October 2024 Supplementary Examinations

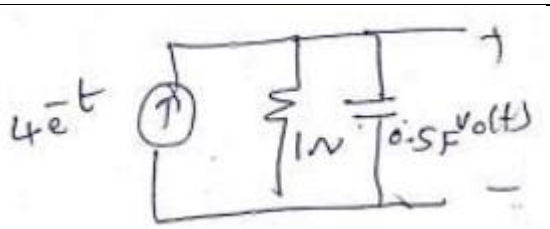
Programme: B.E. **Semester: IV**
Branch: Electrical and Electronics Engineering **Duration: 3 hrs.**
Course Code: 23EE4BSMAE **Max Marks: 100**
Course: Mathematical Applications to Electrical Systems

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.

			UNIT - I	CO	PO	Marks
1	a)		Use Eulers method to construct a table of ten approximate values for i(t) in the circuit shown. R= 10 Ω, L= 0.1H. Use step size = 0.1. 	CO2	PO3	**10**
	b)		Arrive at an expression for the voltage across the capacitor using Bernoulli equation, when V(0)= 0. 	CO2	PO3	**10**
			UNIT - II			
2	a)		Solve the IVP $y''+y=0.001x^2$. Given y(0)=0, y′ (0)=1.5.	CO2	PO3	**10**
	b)		Arrive at an expression for solution of linear homogeneous second order ODE with constant coefficients when real double root occurs.	CO1	PO1	**10**
			OR			
3	a)		State and prove superposition theorem for the homogeneous linear ODE.	CO1	PO1	**05**
	b)		Verify by substitution that the functions $y= x^2$ and y=1 are solutions of the nonlinear ODE y″y-xy′=0, but their sum is not a solution.	CO2	PO3	**05**

		c)	Find the steady-state current in the RLC-circuit shown for the given data. R= 4 Ω, L= 0.1H, C=0.05F, E=110 V. Initial current and charge is zero.  	*CO2*	*PO3*	**10**
			UNIT - III			
	4	a)	Find Laplace transform of cosωt and sinωt.	*CO1*	*PO1*	**06**
		b)	Find the response (the current) of the RLC-circuit shown, where E(t) = 100 sin 400t and current and charge are initially zero.  	*CO2*	*PO3*	**10**
		c)	Find Laplace transform of first derivative of y(t).	*CO1*	*PO1*	**04**
			UNIT - IV			
	5	a)	Obtain all the branch currents for the circuit shown using Gauss Elimination method.  	*CO2*	*PO3*	**10**
		b)	Find Eigen values and Eigen vectors for the matrix: $\mathbf{A} = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.	*CO2*	*PO3*	**10**
			UNIT - V			
	6	a)	Find the Fourier series of the function f (x) =$3x^2$, for 0<x<2π.	*CO2*	*PO3*	**10**
		b)	Compute 4 point DFT of the sequence x(n)= {1,1,1,0}	*CO2*	*PO3*	**10**
			OR			
	7	a)	The current supplied by the source in the figure is i(t)=$4e^{-t}$. Find the voltage V_0 using Fourier transform method.	*CO2*	*PO3*	**10**

						
		b)	Find half-range cosine expansion of the function. $f(x) = \begin{cases} \frac{2k}{L}x & \text{if} \quad 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x) & \text{if} \quad \frac{L}{2} < x < L. \end{cases}$	*CO1*	*PO1*	**10**

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