EE210.	Final Examination		Jan. 27, 2004
Student Name:	***Serial No.*** ____	Univ. No.	Section:

1. The voltage across a circuit element is $v = 20 - 30\,e^{-50t}$ V, and the current into the + terminal is $i = 4\,e^{-50t}$ A. Therefore, the energy absorbed by the element during the interval $0 \le t \le 10$ ms is:

(a) 1.811 J	(b) 0.129 J	(c) – 0.129 J	(d) 3.329 J

2. In the circuit of Figure (A), the equivalent resistance across the x-y terminals is:

(a) 2.5 Ω	(b) 5 Ω	(c) 2 Ω	(d) 4 Ω

3. The power absorbed by the dependent source in the circuit of Figure (A) is:

(a) –30 W	(b) 30 W	(c) –25 W	(d) –15 W

4. In the circuit of Figure (B), where all resistance values are in Ω, the value of I_0 is:

(a) 3 A	(b) –4 A	(c) –6 A	(d) –3 A

5. In the circuit of Figure (C), where all resistance values are in Ω, the value of V_0 is:

(a) 4 V	(b) –3 V	(c) –4 V	(d) –6 V

6. In the circuit of Figure (D), where all resistance values are in Ω, nodal analysis quickly gives:

(a) $I_0 = -5/3$ A	(b) $I_0 = 1$ A	(c) $I_0 = -1$ A	(d) $I_0 = 5/3$ A

7. In the circuit of Figure (E), where all resistance values are in Ω, mesh analysis quickly gives:

(a) $I_0 = 5$ A	(b) $I_0 = 1$ A	(c) $I_0 = 7$ A	(d) $I_0 = 3$ A

8. For the linear circuit of Figure (G), $i_s = 1$ A when $v_s = 60$ V, and $i_s = -0.5$ A when $v_s = 30$ V. Therefore, the equivalent Thevenin voltage and resistance values are:

(a) 20 V, 20 Ω	(b) 40 V, 20 Ω	(c) –40 V, 20 Ω	(d) –20 V, 40 Ω

9. If the operational amplifier in the circuit of Figure (H) is ideal, then:

(a) $V_0 = 18$ V	(b) $V_0 = 6$ V	(c) $V_0 = 10$ V	(d) $V_0 = -9$ V

10. The circuit of Figure (I) represents an analog solution of the following differential equation with the indicated initial condition:

(a) $dv/dt - 10\,v = 50$; $v(0) = 10$ V	(b) $dv/dt + 10\,v = 50$; $v(0) = -10$ V
(c) $dv/dt - 10\,v = 25$; $v(0) = 10$ V	(d) $dv/dt - 15\,v = 50$; $v(0) = 10$ V

11. In the circuit of Figure (J), with t in ms, the expression for $v_0(t)$ in volts is:

(a) $25(1 - e^{-t} - e^{-t/2})$	(b) $A\,e^{-500t}\cos(500\,t)$	(c) $25(1 + e^{-t} + e^{-t/2})$	(d) $(A + B\,t)\,e^{-500t}$

12. In the circuit of Figure (K), the initial conditions $i_L(0^+)$, $v_C(0^+)$, and $i_R(0^+)$, respectively, using the units of mA and V are:

(a) –50, 50, 0.0	(b) –50, –50, 100	(c) 50, 50, 100	(d) 50, –50, 100

Q	1	2	3	4	5	6	7	8	9	10	11	12
A												

EE210.	Final Examination		Jan. 27, 2004
Student Name:	***Serial No.***	Univ. No.	Section:

13. In the circuit of Figure (K), the initial values of di_L/dt, and dv_C/dt at $t = 0^+$ are:

(a) −8 A/s , 50 kV/s	(b) −8 A/s , −50 kV/s	(c) 8 A/s , −5 kV/s	(d) 8 A/s , 500 V/s

14. In the RLC circuit of Figure (L), $i_L(0^-) = 0$, $v_C(0^-) = 0$, and $t_1 > 0$. Therefore, for $0 < t < t_1$, the form of the response $v_C(t)$ in volts may be expressed as:

(a) $5 + (A + B\,t)\,e^{-t/4}$	(b) $-5 + [5\cos(1.936\,t) + B\sin(1.936\,t)]\,e^{-4t}$
(c) $-5 + (A + B\,t)\,e^{-4t}$	(d) $5 + [A\cos(1.936\,t) + B\sin(1.936\,t)]\,e^{-t/4}$

15. In the RLC circuit problem of Figure (L), for $t > t_1$, the form of the response $v_C(t)$ in volts is:

(a) $(A + B\,t)\,e^{-2t}$	(b) $A\,e^{-3.414t} + B\,e^{-0.586t}$	(c) $A\,e^{-2t}\cos t$	(d) $A\,e^{-2t}\sin 2t$

16. In a critically damped parallel RLC circuit, the capacitor voltage response to a step-input current is as shown in Figure (M). This indicates that the value of α is:

(a) 200 Np/s	(b) 100 Np/s	(c) 47 Np/s	(d) 150 Np/s

17. In a series RLC circuit, the current response to a step-input voltage is as shown in Figure (N). This yields the following values for α in Np/s, ω_d and ω_0 in rad/s, respectively:

(a) 100, 3248, 3250	(b) 2000, 3464, 4000	(c) 1000, 3142, 3297	(d) 2000, 3000, 3606

18. The sum, $\mathbf{V}_t$, of the phasors $\mathbf{V}_1 = 13\,\underline{/22.62^0}$ V, $\mathbf{V}_2 = 10\,\underline{/143.13^0}$ V, and $\mathbf{V}_3 = 5\,\underline{/-53.13^0}$ V is:

(a) $\mathbf{V}_t = 21.2\,\underline{/45^0}$ V	(b) $\mathbf{V}_t = 9.9\,\underline{/45^0}$ V	(c) $\mathbf{V}_t = 14.1\,\underline{/-45^0}$ V	(d) $\mathbf{V}_t = 11.4\,\underline{/37.9^0}$ V

19. In the circuit of Figure (O), the value of L that makes $i_g(t)$ in phase with $v_g(t) = 80\cos(5000t)$ V is:

(a) 2 H	(b) 0.5 H	(c) 1 H or 0.25 H	(d) 2 H or 0.5 H

20. When $i_g(t)$ in the circuit problem of Figure (O) is in phase with $v_g(t)$, its peak value is:

(a) 80 or 20 mA	(b) 80 mA	(c) 40 or 20 mA	(d) 20 mA

21. In the circuit of Figure (P), $i_s(t) = 12.5\cos(5000t)$ mA. Therefore, the peak value of $v_0(t)$ is:

(a) 22.36 V	(b) 67.1 V	(c) 89.44 V	(d) 44.72 V

22. For the circuit of Figure (Q) with $\omega = 1$ rad/s, the equivalent Thevenin voltage seen at x-y is:

(a) $1.414\,\underline{/45^0}$ V	(b) $0.707\,\underline{/-90^0}$ V	(c) $0.707\,\underline{/-45^0}$ V	(d) $1.414\,\underline{/90^0}$ V

23. At f = 318.31 Hz, $\mathbf{Z} = 0.8944\,\underline{/26.57^0}\ \Omega$ can be represented by two elements in parallel as:

(a) R, L = 2 kΩ, 1 H	(b) R, C = 1 kΩ, 1 μF	(c) R, C = 2 kΩ, 2 μF	(d) R, L = 1 kΩ, 1 H

24. As a function of ω, the imaginary part of the input impedance, $\mathbf{Z}_i$, of the circuit of Figure (R) is:

(a) $100\,\omega^2/(\omega^2 + 100)$	(b) $50\,(\omega^2 - 100)/[\omega\,(\omega^2 + 100)]$
(c) $100\,\omega/(\omega^2 - 100)$	(d) $50\,(\omega^2 - 100)/(\omega^2 + 100)$

Student Name: *Serial No.* Univ. No. Section: