Final Exam
December 15, 2004

Divisions: 0001 (Capano); 0002 (Capano);
0003 (Chen); 0004 (Hu);

INSTRUCTIONS:

- There are twenty (25) multiple choice problems worth 10 points each.
- Our goal is to assess what you know, not what you do not know. To maximize our assessment of your knowledge and understanding, do NOT dwell on a single problem. If you get stuck, move on to the next problem and return later, time permitting. It is important to work patiently, efficiently, and in an organized manner.
- This is a closed book, closed notes exam.

All students are expected to abide by the usual ethical standards of the university, i.e., your answers must reflect only your own knowledge and reasoning ability. Students caught cheating will receive a grade of 'F' for the course.

Table 9.2 and possibly useful equation

$$x(t) = x(\infty) + [x(t_o^+) - x(\infty)]\, e^{-(t-t_o)/\tau}$$

TABLE 9.2 General Solutions for Constant-Source Second-Order Networks

General solution of the driven differential equation

$$\frac{d^2x}{dt^2} + b\frac{dx}{dt} + cx = F$$

having characteristic equation $s^2 + bs + c = (s - s_1)(s - s_2) = 0$, with roots

$$s_1, s_2 = \frac{-b \pm \sqrt{b^2 - 4c}}{2}$$

Case 1. Real and distinct roots: $b^2 - 4c > 0$:

$$x(t) = K_1 e^{s_1 t} + K_2 e^{s_2 t} + X_F$$

where $X_F = F/c$, and

$$x(0^+) = K_1 + K_2 + X_F$$

$$x'(0^+) = s_1 K_1 + s_2 K_2$$

Case 2. The roots $s_1 = -\sigma + j\omega_d$ and $s_2 = -\sigma - j\omega_d$ of the characteristic equation are distinct but complex; $b^2 - 4c < 0$:

$$x(t) = e^{-\sigma t}[A\cos(\omega_d t) + B\sin(\omega_d t)] + X_F$$

where again $X_F = F/c$, and

$$x(0^+) = A + X_F$$

$$x'(0^+) = -\sigma A + \omega_d B$$

Case 3. The roots are real and equal; $s_1 = s_2$ and $b^2 - 4c = 0$:

$$x(t) = (K_1 + K_2 t)e^{s_1 t} + X_F$$

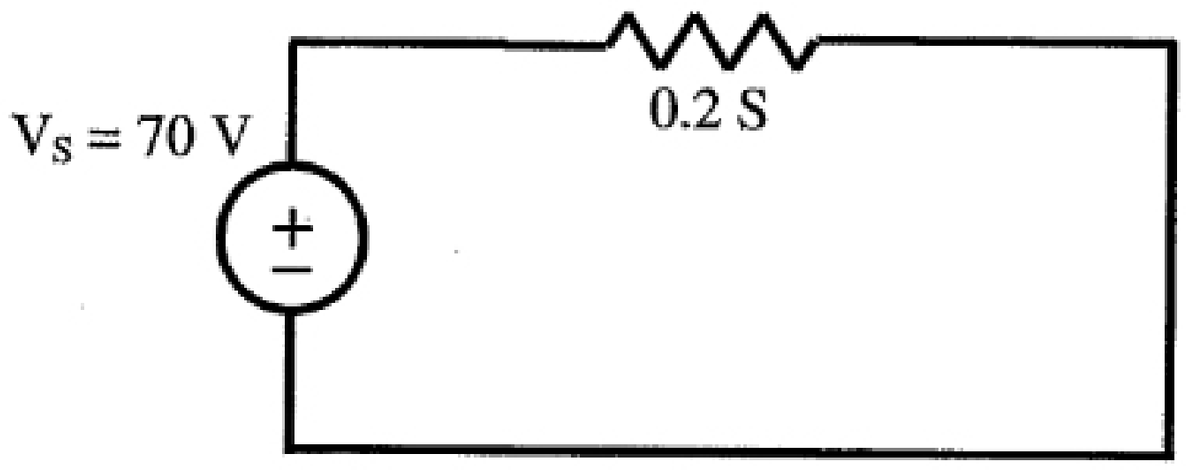
where again $X_F = F/c$, and

$$x(0^+) = K_1 + X_F$$

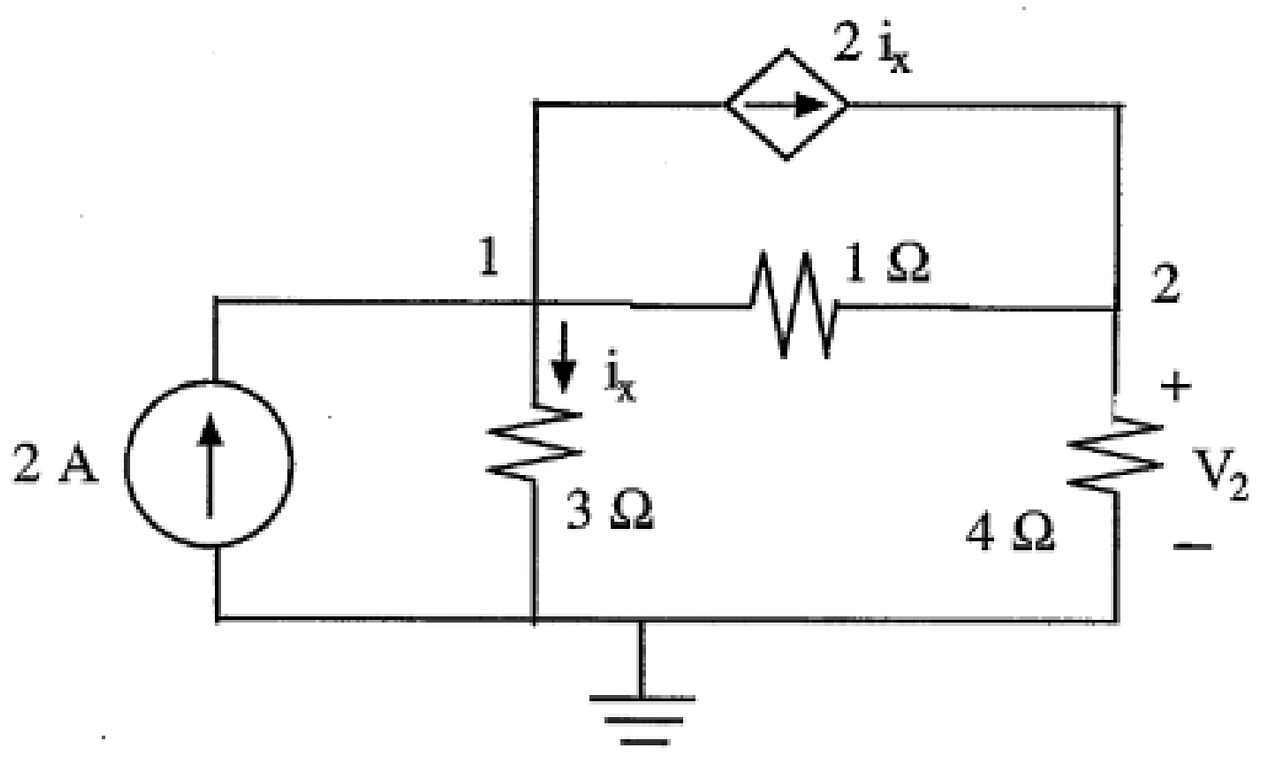
$$x'(0^+) = s_1 K_1 + K_2$$

1. In the circuit below, the current through the resistor is:

(1) 14 A flowing from left to right
(2) 12 A flowing from right to left
(3) 25 A flowing from right to left
(4) 350 A flowing from left to right
(5) 5 A flowing from right to left
(6) 70 A flowing from left to right



2. The nodal voltage V_2, in V, is:



(1) 10 (2) -8 (3) 4 (4) 8
(5) -6 (6) 6 (7) -4