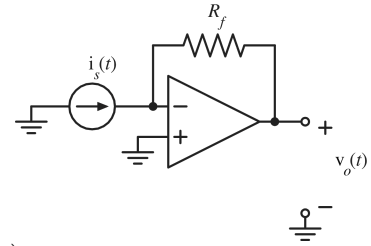# Solution of ECE 300 Test 5 F10

1. Find the numerical value of the output voltage $v_o(t)$ at time $t = 0.3$ ms.

$$i_s(t) = 7\sin(2000\pi t) \ \mu A \ , \ R_f = 1 \ M\Omega$$

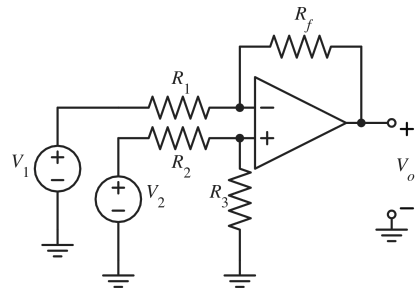$$v_o(t) = -R_f \, i_s(t) = -1 \ M\Omega \times 7\sin(2000\pi t) \ \mu A = -7\sin(2000\pi t) \ V$$

$$v_o(0.3 \ ms) = -7\sin(2000\pi \times 0.0003) \ V = -6.6574 \ V$$

2. Find the numerical value of V_o.

$$V_1 = 18V \ , \ V_2 = 7 \ V \ , \ R_1 = 30 \ k\Omega \ , \ R_2 = 12 \ k\Omega$$
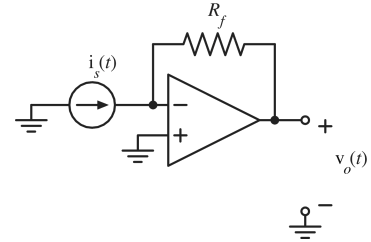$$R_3 = 50 \ k\Omega \ , \ R_f = 120 \ k\Omega$$

$$V_o = -\frac{R_f}{R_1}V_1 + \frac{R_3}{R_2 + R_3}\frac{R_f + R_1}{R_1}V_2 = -\frac{120 \ k\Omega}{30 \ k\Omega}18V + \frac{50 \ k\Omega}{50 \ k\Omega + 12 \ k\Omega}\frac{120 \ k\Omega + 30 \ k\Omega}{30 \ k\Omega}7V$$

$$V_o = -72V + 0.8065 \times 5 \times 7V = -43.7742 \ V$$

Solution of ECE 300 Test 5 F10

1.   Find the numerical value of the output voltage $v_o(t)$ at time $t = 0.3$ ms.

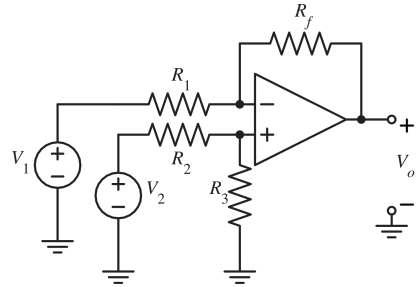$$i_s(t) = 3\sin(2500\pi t)\ \mu\text{A} \ , \ R_f = 1\ \text{M}\Omega$$

$$v_o(t) = -R_f\, i_s(t) = -1\ \text{M}\Omega \times 3\sin(2500\pi t)\ \mu\text{A} = -3\sin(2500\pi t)\ \text{V}$$

$$v_o(0.3\ \text{ms}) = -3\sin(2500\pi \times 0.0003)\ \text{V} = -2.1213\ \text{V}$$

2.   Find the numerical value of V_o.

$$V_1 = 13\text{V} \ , \ V_2 = 11\ \text{V} \ , \ R_1 = 30\ \text{k}\Omega \ , \ R_2 = 12\ \text{k}\Omega$$
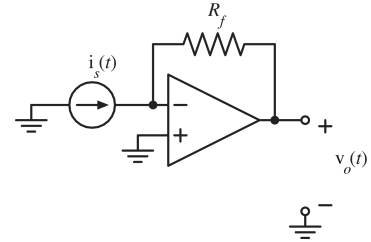$$R_3 = 50\ \text{k}\Omega \ , \ R_f = 120\ \text{k}\Omega$$

$$V_o = -\frac{R_f}{R_1}V_1 + \frac{R_3}{R_2 + R_3}\frac{R_f + R_1}{R_1}V_2 = -\frac{120\ \text{k}\Omega}{30\ \text{k}\Omega}13\text{V} + \frac{50\ \text{k}\Omega}{50\ \text{k}\Omega + 12\ \text{k}\Omega}\frac{120\ \text{k}\Omega + 30\ \text{k}\Omega}{30\ \text{k}\Omega}11\text{V}$$

$$V_o = -52\text{V} + 0.8065 \times 5 \times 11\text{V} = -7.6452\ \text{V}$$

Solution of ECE 300 Test 5 F10

1. Find the numerical value of the output voltage $v_o(t)$ at time $t = 0.3$ ms.

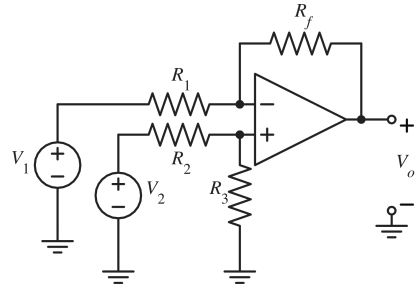$$i_s(t) = 2\sin(2200\pi t) \ \mu\text{A} \ , \ R_f = 1 \ \text{M}\Omega$$

$$v_o(t) = -R_f \, i_s(t) = -1 \ \text{M}\Omega \times 2\sin(2200\pi t) \ \mu\text{A} = -2\sin(2200\pi t) \ \text{V}$$

$$v_o(0.3 \ \text{ms}) = -2\sin(2200\pi \times 0.0003) \ \text{V} = -1.7526 \ \text{V}$$

2. Find the numerical value of V_o.

$$V_1 = 4\text{V} \ , \ V_2 = 13 \ \text{V} \ , \ R_1 = 30 \ \text{k}\Omega \ , \ R_2 = 12 \ \text{k}\Omega$$
$$R_3 = 50 \ \text{k}\Omega \ , \ R_f = 120 \ \text{k}\Omega$$

$$V_o = -\frac{R_f}{R_1}V_1 + \frac{R_3}{R_2 + R_3}\frac{R_f + R_1}{R_1}V_2 = -\frac{120 \ \text{k}\Omega}{30 \ \text{k}\Omega}4\text{V} + \frac{50 \ \text{k}\Omega}{50 \ \text{k}\Omega + 12 \ \text{k}\Omega}\frac{120 \ \text{k}\Omega + 30 \ \text{k}\Omega}{30 \ \text{k}\Omega}13\text{V}$$

$$V_o = -16\text{V} + 0.8065 \times 5 \times 13\text{V} = 36.42 \ \text{V}$$