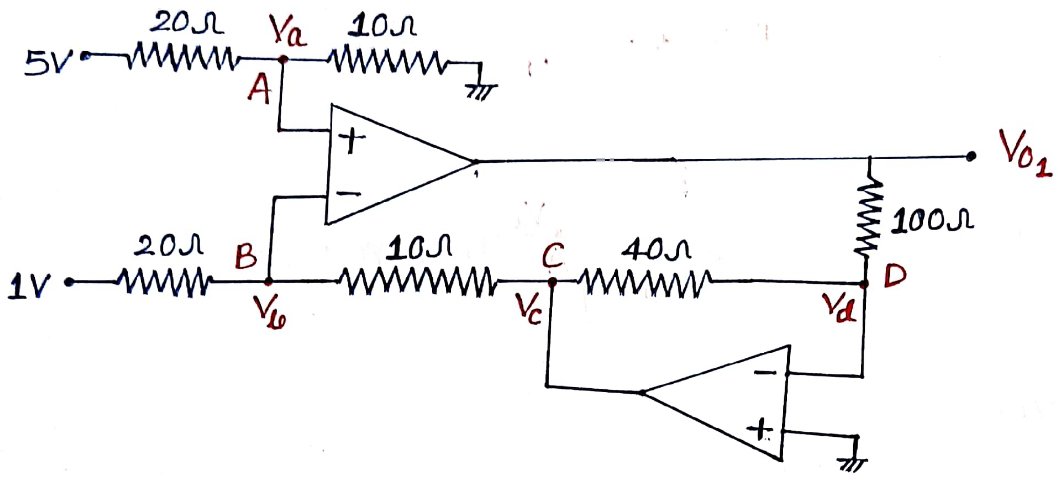
BE ASSIGNMENT-2
SOLUTION

SOL(1) :- (a)

Part(I):



At node-A, $V_a = \left(\frac{10}{10+20}\right)5 = \frac{5}{3}$ Volt

At node-B, $V_b = V_a = \frac{5}{3}$ Volt (Virtual Short)

$$\frac{V_b - 1}{20} + \frac{V_b - V_c}{10} = 0 \quad \text{(KCL at node-B)}$$

$V_c = 2$ Volt

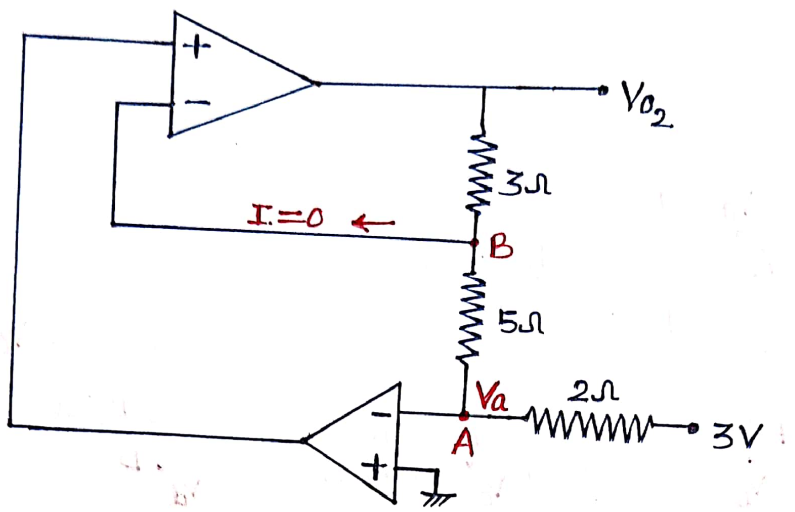
At node-D, $$\frac{V_d - V_c}{40} + \frac{V_d - V_{o1}}{100} = 0 \quad \text{(KCL at node-D)}$$

$V_d = 0$ Volt (Virtual Short)

$V_{o_1} = -5$ Volt —— (1)

→ (2 Mark)

Part (II):



at node−A,

$$V_a = 0 \text{ volt} \quad \text{(Virtual short)}$$

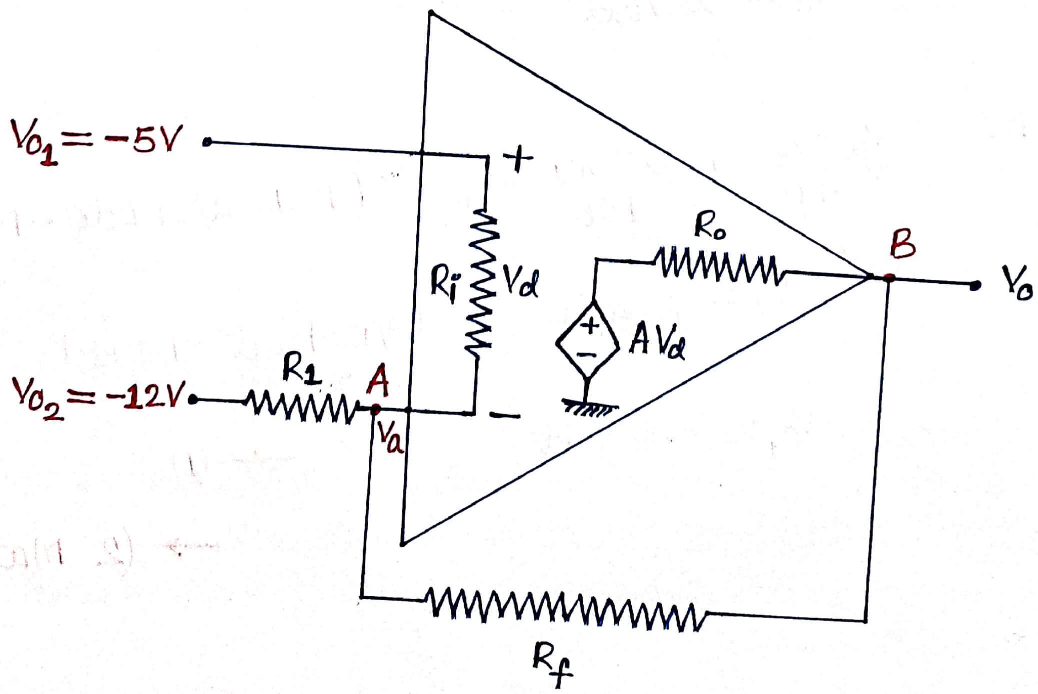
$$\frac{V_a-3}{2} + \frac{V_a - V_{o_2}}{3+5} = 0 \quad \text{(KCL at node−A)}$$

$$V_{o_2} = -\left(\frac{3+5}{2}\right)3 = -12 \text{ Volt}$$

— (2)

→ (2 Mark)

Part (III):



at node-A,

$$\frac{V_a - V_{o_1}}{R_i} + \frac{V_a - V_{o_2}}{R_1} + \frac{V_a - V_o}{R_f} = 0 \qquad \text{(KCL at node-A)}$$

$$\frac{V_a + 5}{2\times 10^6} + \frac{V_a + 12}{4.7\times 10^3} + \frac{V_a - V_o}{47\times 10^3} = 0 \qquad \text{— (3)}$$

at node-B,

$$\frac{V_o - V_a}{R_f} + \frac{V_o - AV_d}{R_o} = 0 \qquad \text{(KCL at node-B)}$$

$$\frac{V_o - V_a}{R_f} + \frac{V_o - A(V_{o_1} - V_a)}{R_o} = 0$$

$$\frac{V_o - V_a}{47\times 10^3} + \frac{V_o - 2\times 10^5(-5 - V_a)}{75} = 0 \qquad \text{— (4)}$$

By eq^n(3) & eq^n(4), we get —

$V_a = -5$ volt

$V_o = 64.99$ volt → (2 Mark)

SOL(1)(b):

$$V_o = \left(1 + \frac{R_F}{R_1}\right)V_{o_1} + \left(-\frac{R_F}{R_1}\right)V_{o_2}$$

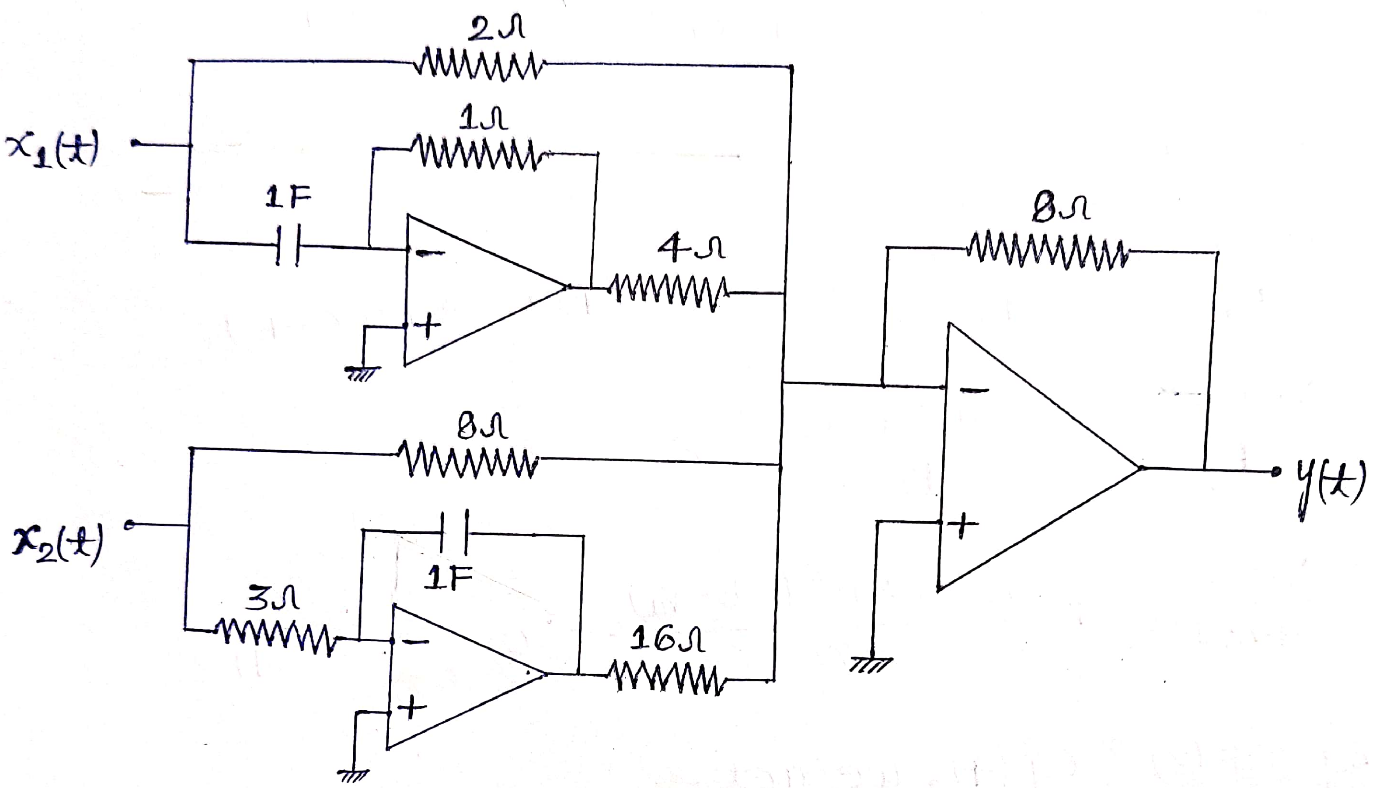
$$= \left(1 + \frac{47}{4.7}\right)(-5) + \left(-\frac{47}{4.7}\right)(-12)$$

$= 65$ volt → (1.5 Mark)

SOL(2)(a):-

Given that —

$$y(t) = -4\, x_1(t) + 2\frac{d}{dt}x_1(t) - x_2(t) + \frac{1}{6}\int x_2(t)\,dt$$

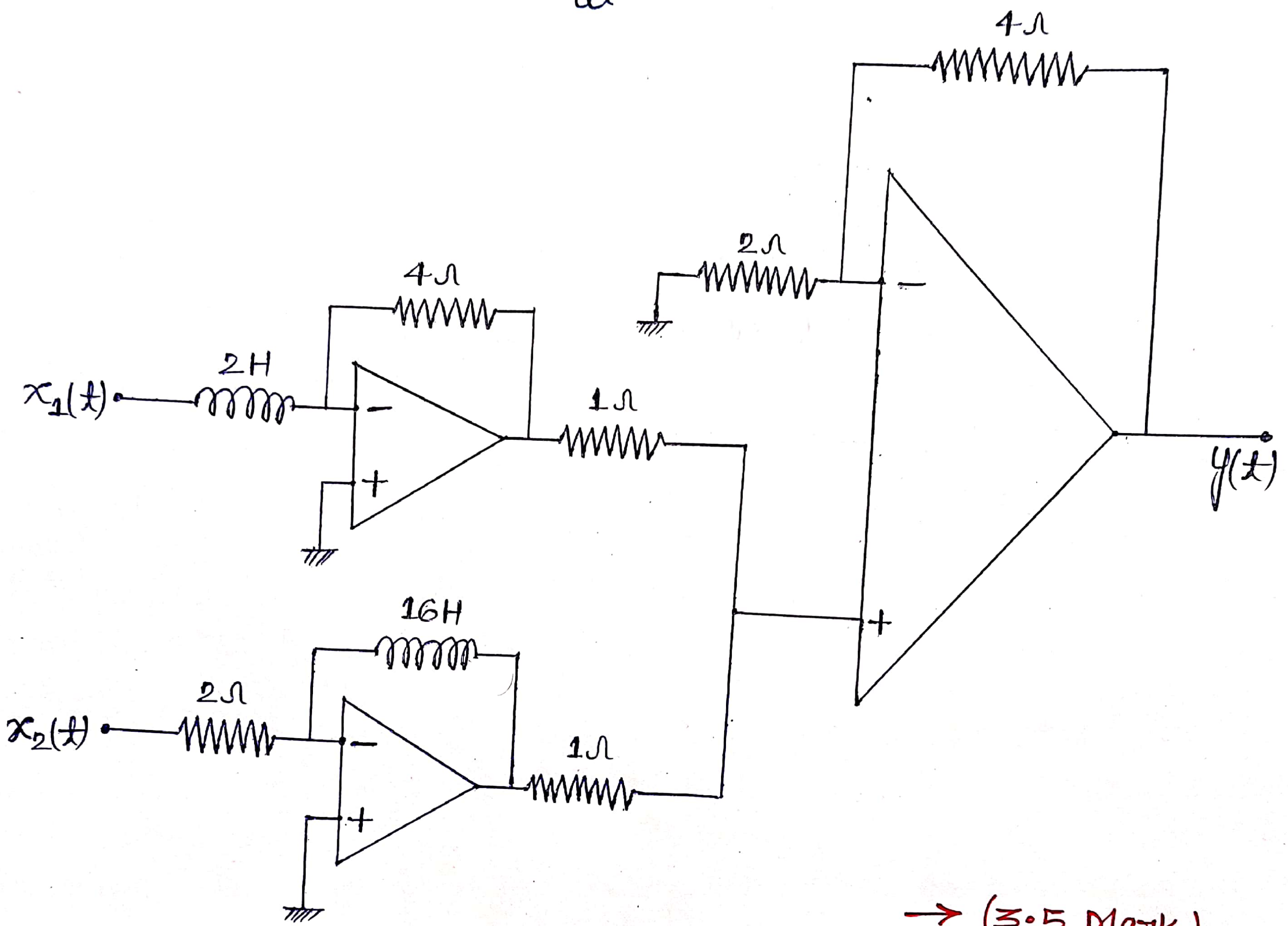


→ (4 Mark)

SOL (2)(b):-

Given that -

$$y(t) = -3\int x_1(t)\,dt - 12\,\frac{d\,x_2(t)}{dt}$$



→ (3.5 Mark)