Tutorial Sheet - 4 IEC103

Q1. Find the output voltage V_o of the amplifier circuit shown in Fig. Q1. Assume that all op-amps are ideal and none of the op-amps saturate.

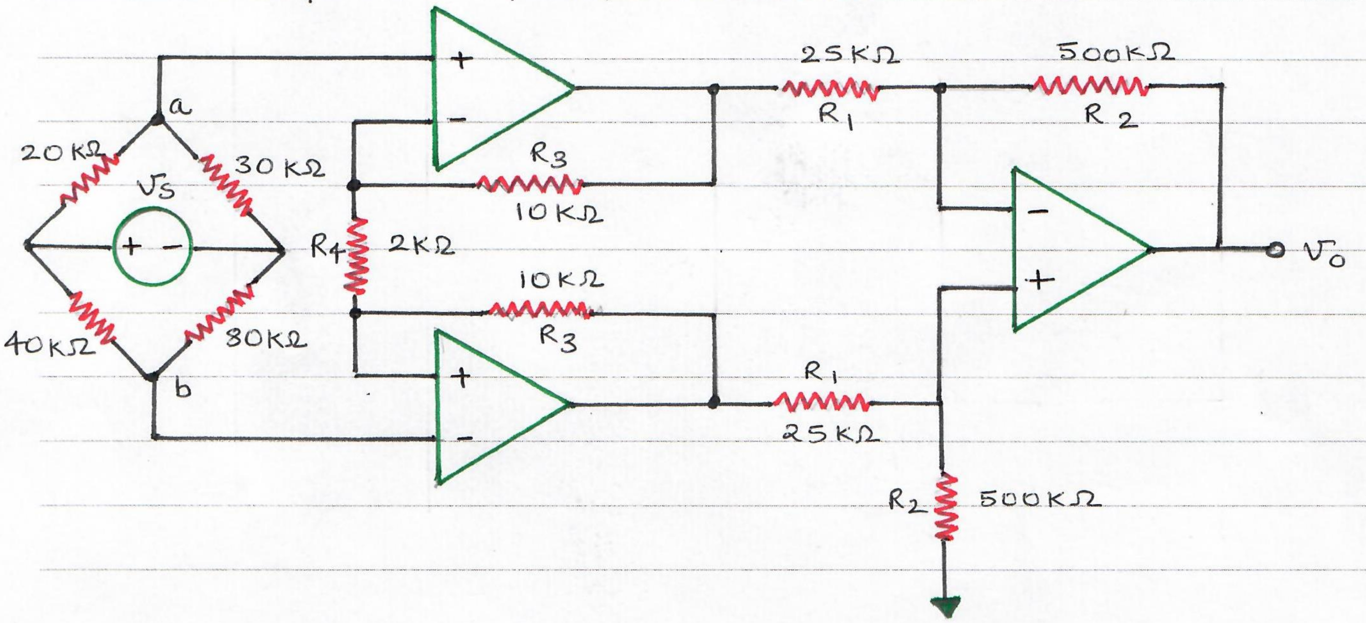

Fig. Q1

(Q2) The opamp circuit shown in Fig. Q2 is designed to amplify a voltage signal and current signal from two transducers. Applying superposition, find the output voltage $v_o(t)$ in terms of inputs $v_{IN}(t)$ and $i_{IN}(t)$. You may find it convenient to first find the ~~in~~ values of intermediate variables $v_1(t)$ and $v_2(t)$ shown in the Fig. 2 and then find $v_o(t)$. Assume that op amps are ideal.

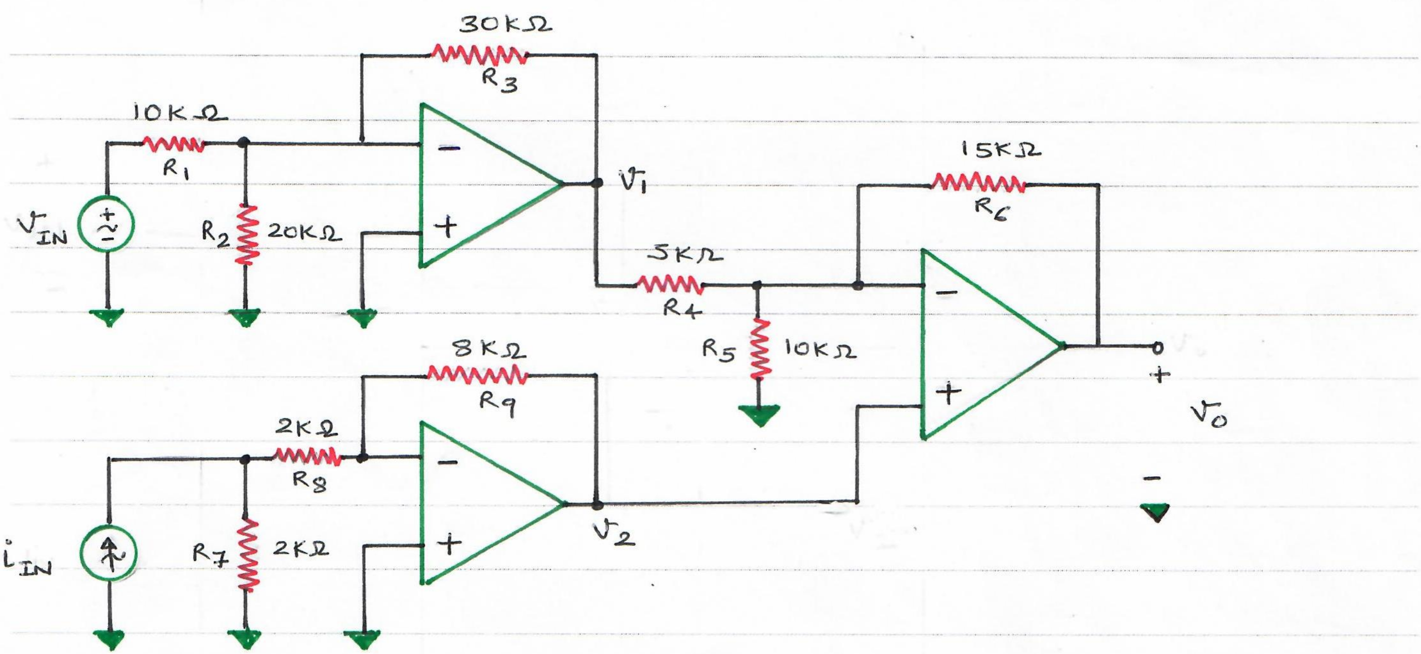

Fig. Q2

Q3. i) What type of feedback is incorporated in Q.3a, Q.3b, Q.3c, and Q.3d.

ii) Assuming ideal op amp, find β and A_f relevant to each circuit.

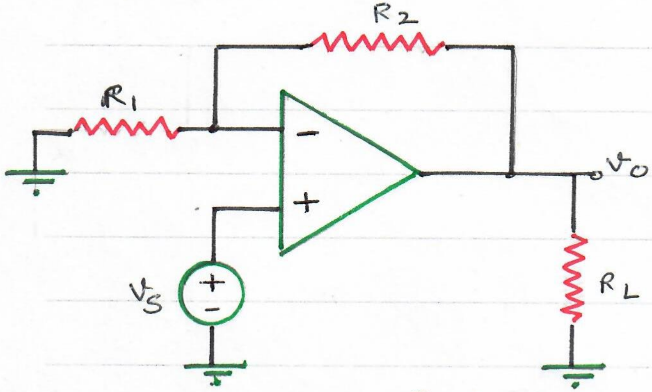

Fig. Q3a

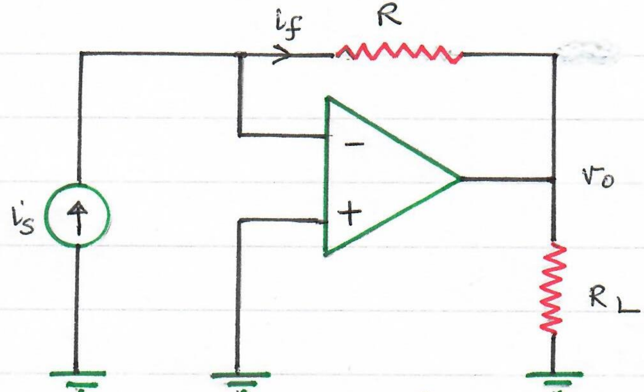

Fig. Q.3b

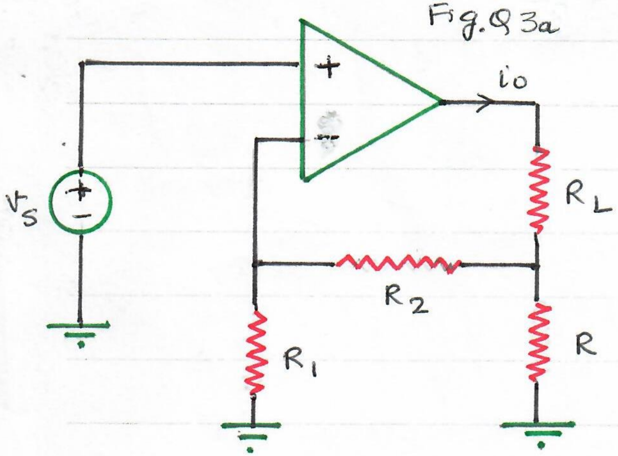

Fig. Q3c

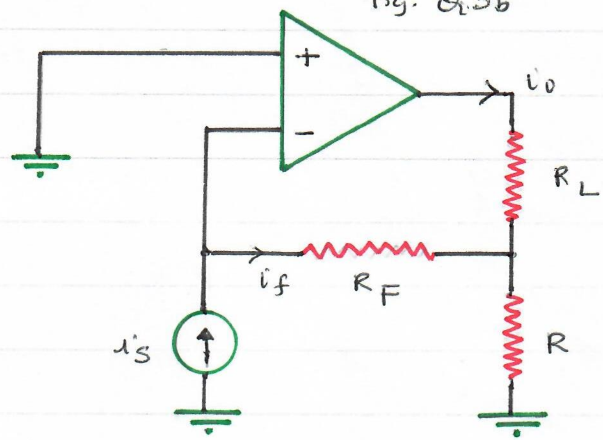

Fig. Q.3d

Q4 For the amplifier circuit shown in Fig. Q4, find the expression for i_L interms of v_S, if $R_2 = R_4$ and $R_1 = R_3$. What type of amplifier is it ?

Assume that the op-amp is ideal and operate in linear region.

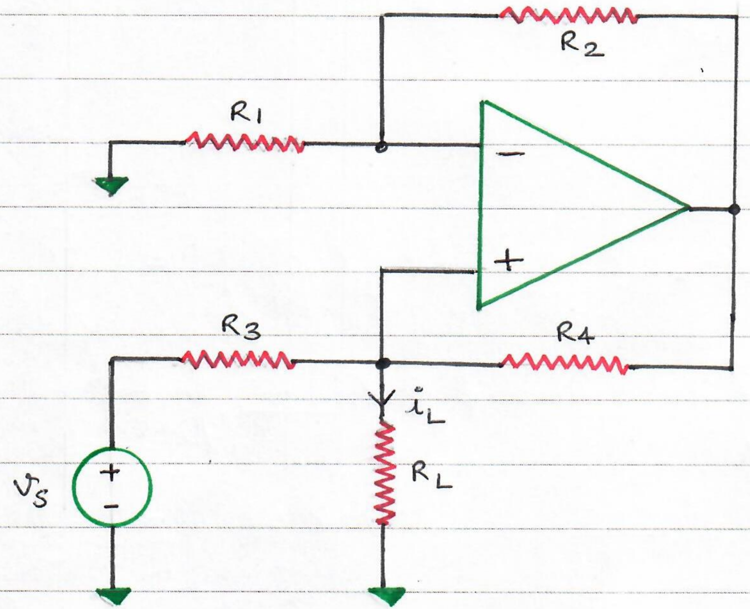

Fig. Q4

(Q5) Fig. Q5 shows a feedback transconductance amplifier implemented using an op amp with open-loop gain μ, a very large input resistance (∞), and an output resistance r_o. The output current I_o that is delivered to the load resistance R_L is sensed by the feedback network composed of three resistances R_M, R_1, and R_2, and a proportional voltage V_f is fed back to the negative-input terminal of the op amp. Find the expressions for $A = I_o/V_i$, $\beta = V_f/I_o$, and $A_f = I_o/V_s$. If the loop gain is large, find the approximate expression for A_f (closed-loop gain)

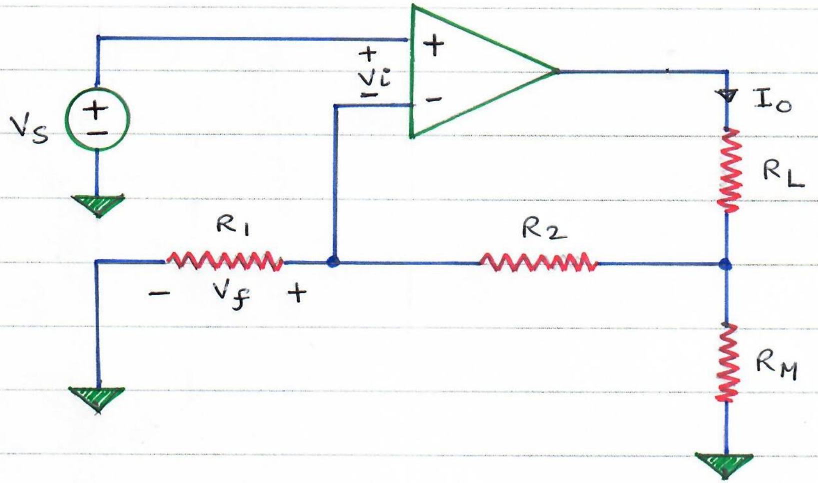

Fig. Q5