

Name: ..... Roll. No. ....

Department of Electrical Engineering,  
Indian Institute of Technology, Kanpur

ESC201  
Total Marks: 5

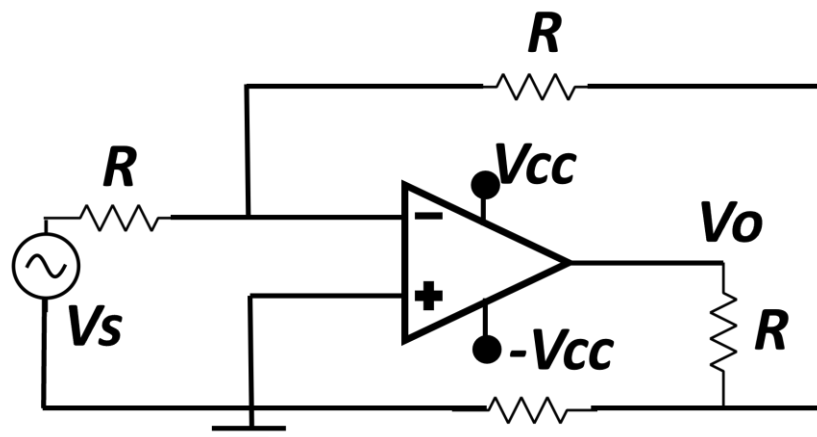
Mini-Quiz V

25/03/2025  
Time: 10 minutes

Instructions

- Please write your name and roll number first.
- Read the question carefully and answer it in the question paper itself.

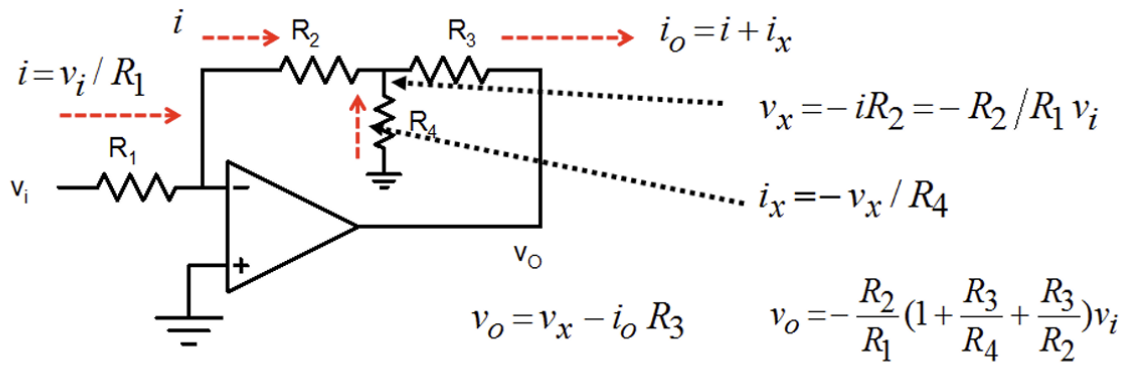
- 1) For the circuit shown below, the specifications of the operational amplifier are:  $A_v = 10^5$ ,  $R_i = 1 \text{ G}\Omega$ , and  $V_{CC} = 12 \text{ V}$ . For  $V_s = 0.5 \sin(\omega t) \text{ V}$  and  $R = 100 \Omega$ , answer the following questions:
- (a) Does this circuit employ any feedback? If yes, what is the nature of the feedback? Are there two competing feedback mechanisms? (1.5 marks)
- (b) Does the output of the operational amplifier,  $V_o$  depend on  $V_s$ ? If no, what is  $V_o$ ? If yes, what is  $\frac{V_o}{V_s}$ ? (3.5 marks)



- a) The non-inverting terminal is always grounded. A component of  $V_o$  is connected to the inverting terminal which reduces the overall input. (0.5)  
Yes, there is a negative feedback. There are no competing feedback mechanism. (0.5)
- b) For opamp with negative feedback, large  $A_v$  &  $R_i$ , we can apply the concept of virtual ground. So, Yes!  $V_o$  depends on  $V_s$  in this inverting amplifier configuration. (0.5)  
if drawn in ckt. correct intent

The given circuit is same as the one given in assignment 7, Q.1(iv) with  $R_1=R_2=R_3=R_4$

correct KCL(s)  $\rightarrow$  1.5



$$\frac{v_o}{v_s} = -3$$

$\rightarrow$  why voltage divider configuration is not correct approach:

