DM-7085-86

B. E. III (Sem. VI)

(Electrics & Communication) Examination

January - 2008

Analog Integrated Cirucits (AIC)

Time : 3 Hours] [Total Marks : 100

DM-7085

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :
☛ B. E. 3 (Sem. 6) (Electrics & Communication)

Name of the Subject :
☛ Analog Itnegrated Circuits (AIC)

☛ Subject Code No. : 7 0 8 5 ☛ Section No. (1, 2.....) : 1

Seat No. :

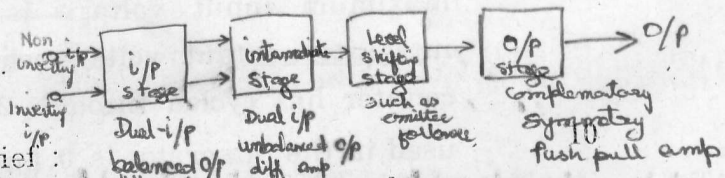
Student's Signature

(2) Attempt **all** questions.

(3) Figures to the **right** indicate full marks.

(4) Answers of two sections must be written in **separate** answer sheets.

(5) Assume data if required.



1 (i) Give answers in brief :

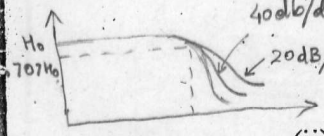
(a) Draw the block diagram of conventional op amp.

(b) State the significance of current Mirror circuit.

(c) Why is the gain of an operational amplifier purposely made extremely large ?

(d) Define resolution and find its value of 8 bit DAC.

(e) Draw and explain (in brief) butterworth filter response.



5

(ii) (a) What do you mean by offset voltage and offset current with respect to an op-amp and also explain how offset null is achieved in IC 741. Also define show rate for op-amp.

(v) Calculate the output offset voltage for the ckt shown below :
(Take input offset voltage = 1 mV and input offset current = 20 nA)

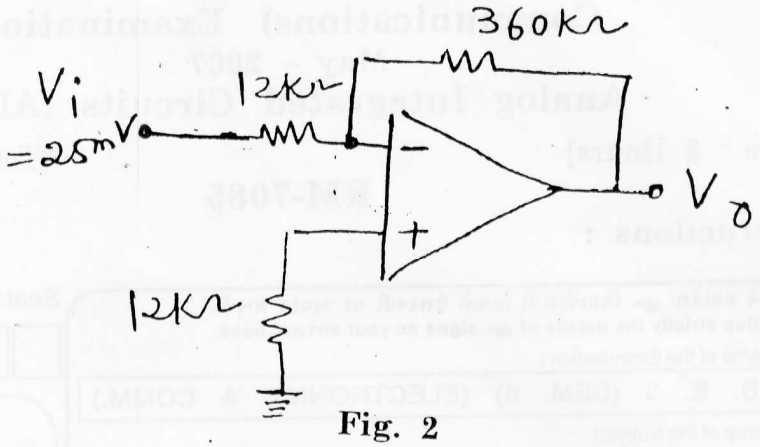


Fig. 2

(b) (i) Design single input balanced output differntial amplifier shown in fig. 3 to meet the following specifications : 5

$R_i \geq 600\ k\Omega$

peak to peak output voltage swing $\leq 5V$

$V_s = \pm 10\ V$

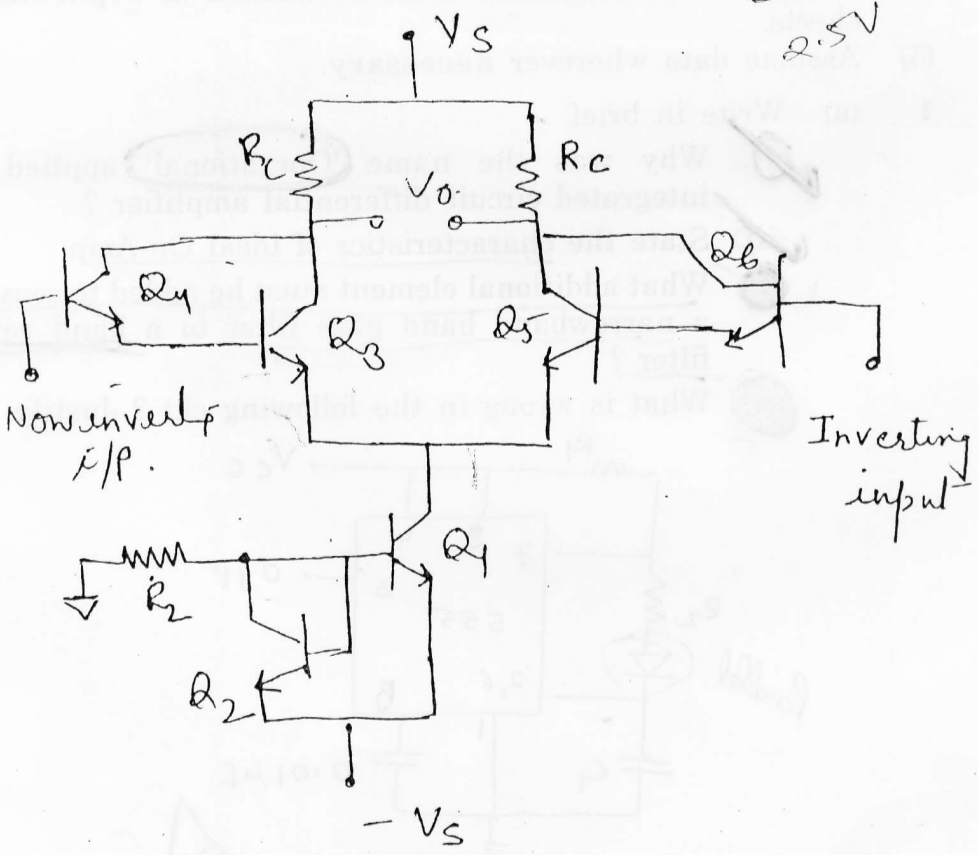


Fig. 3

(ii) Enlist the 4 differential amplifier configuration. Provide D.C. analysis (operating point analysis) of any one. 5

2 Attempt any two : 14

(a) Show that the ckt acts as a differentiator. Also state the advantages of, this ckt.

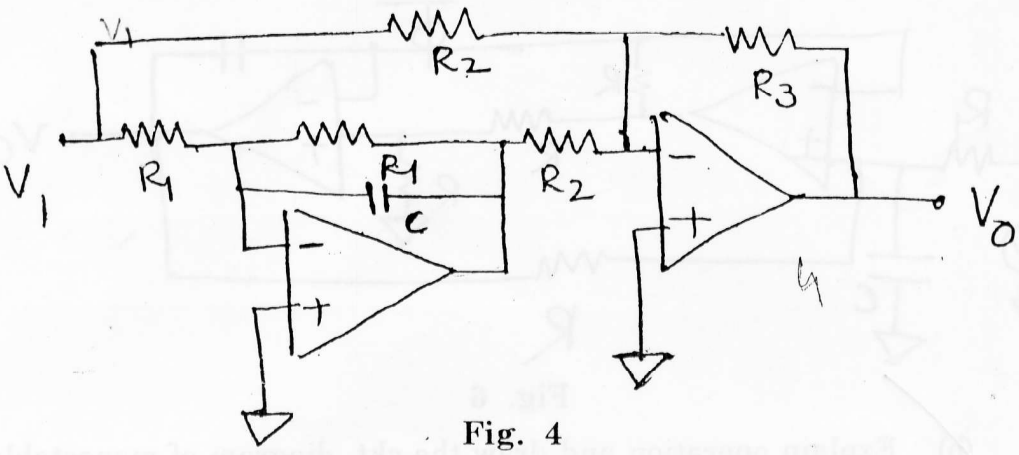


Fig. 4

(b) Obtain voltage gain $\frac{V_0}{V_{in}}$ as

$$\frac{V_0}{V_{in}} = -\frac{A\,R_F R_i}{(R_1 + R_i)(R + R_F) + RR_F + ARR_i}$$

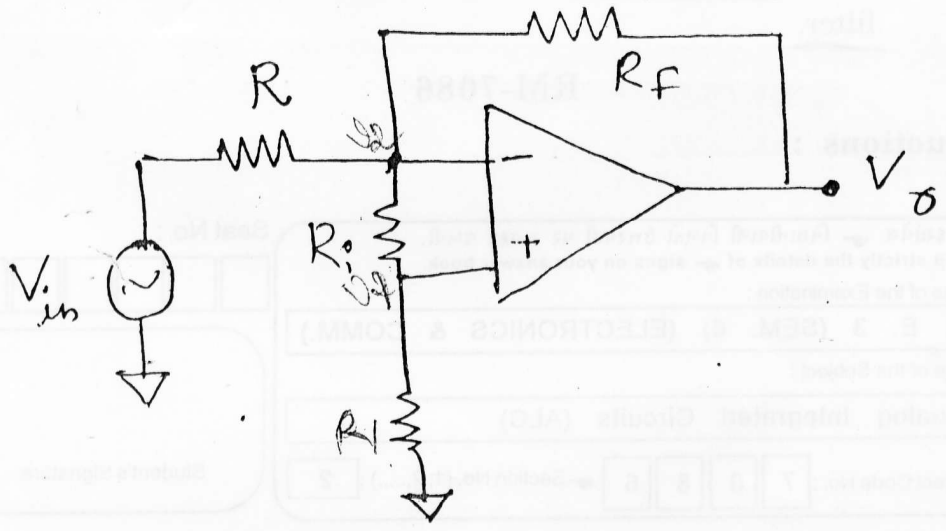


Fig. 5

(c) List the various A/D conversion techniques. Which is the fastest ADC and why ? Also explain the operation of Dual slope ADC. Write important specification of A/D converter.

3 Attempt any two : 16

(a) For the given ckt, $R_1 = \phi R$ and $W_0 = \frac{1}{RC}$, show that 13

$$\frac{V_2}{V_1} = \frac{2\,S\,(W_0/\phi)}{S^2 + \frac{W_0}{\phi}\,S + W_0^2}$$

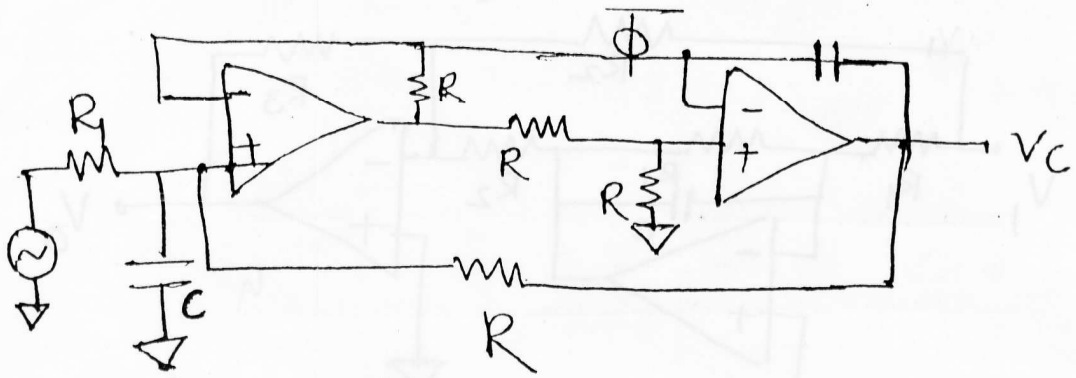


Fig. 6

(b) Explain operation and draw the ckt, diagram of monostable multivibrator using IC 555 and discuss its application as a frequency divider and a pulse stretcher ckt.

(c) Draw notch filter using twin T network and prove that notch filter $f_N = \frac{1}{2\,\pi\,RC}$. Also compare active filter and passive filter.

RM-7086

Instructions :

(1)

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Name of the Examination :

☛ B. E. 3 (SEM. 6) (ELECTRONICS & COMM.)

Name of the Subject :

☛ Analog Integrated Circuits (ALC)

☛ Subject Code No. : 7 0 8 6 ☛ Section No. (1, 2,.....) : 2

Seat No. :

Student's Signature

(2) Attempt **all** questions.

(3) Answers of **two** sections must be written in **separate** answer books.

(4) Assume suitable data wherever **necessary**.

50 to 55

4 (a) Attempt the following questions : 10

(1) Find V_0 for the circuit shown in fig. 7 by assuming ideal Op-Amps.

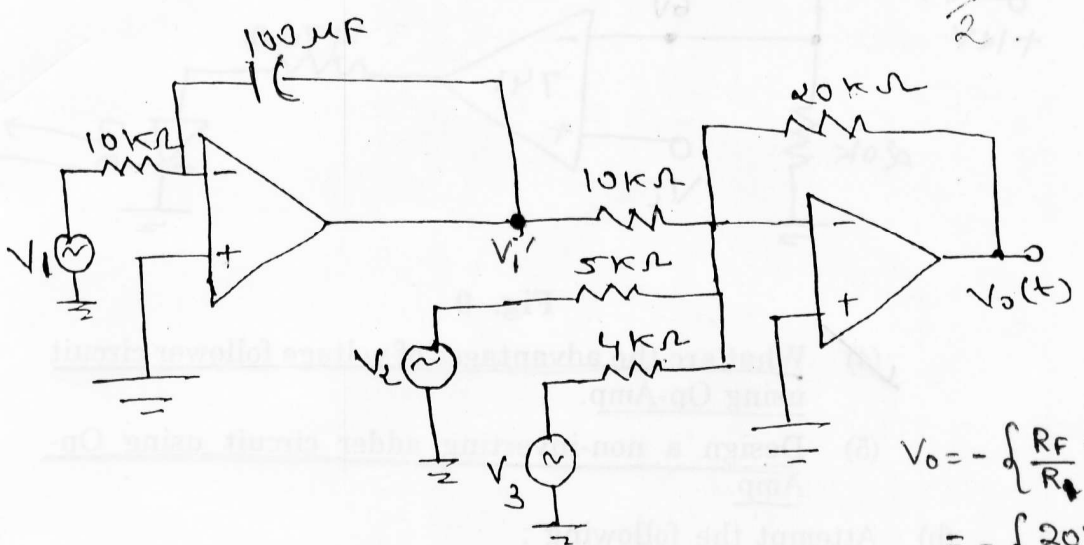

Fig. 7

(2) For the circuit shown in fig. 8, find the Op-Amp output when control input is zero and one. Assume that $R_1 = R_2 = R_3$.

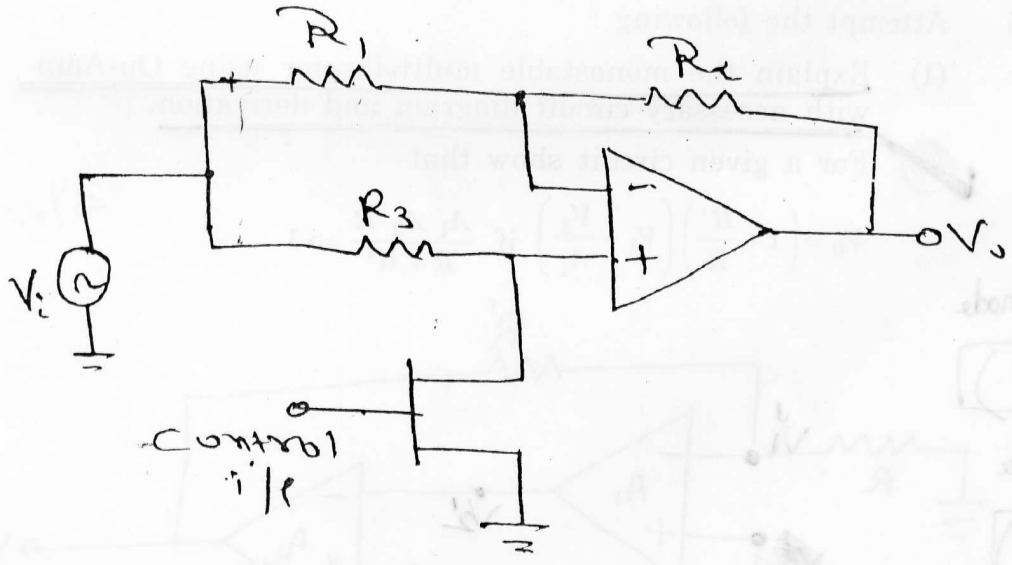

Fig. 8

(3) For the circuit shown in fig. 9 the LED will be on if V_i is

(i) > 12 V (ii) < 12 V (iii) > 6 V (iv) < 6V

Give the reason for your answer.

$V_i > 6V$ O/P = +ve

LED will glow

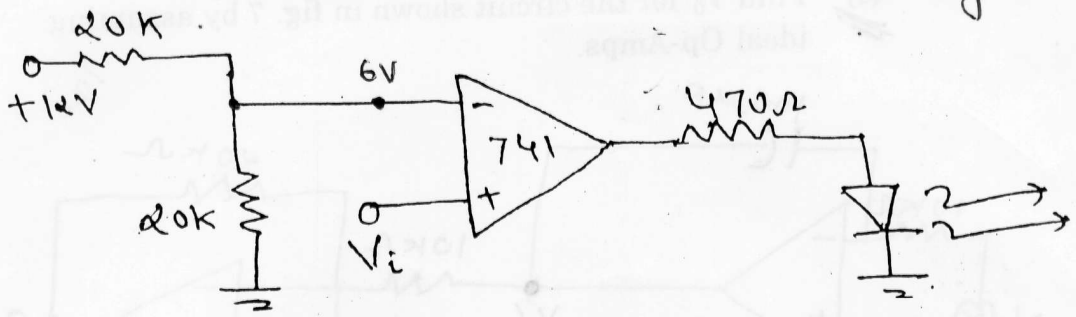

Fig. 9

(4) What are the advantages of voltage follower circuit using Op-Amp.

(5) Design a non-inverting adder circuit using Op-Amp.

(b) Attempt the following : **10**

(1) Give an arrangement to show how Op-Amp adder circuit could be used for multiplying two voltages. 5

(2) Draw and explain positive and negative clipper using Op-Amp.

5 Attempt the following : **16**

(1) Explain the monostable multivibrator using Op-Amp with necessary circuit diagram and derivation. 8

(2) For a given circuit show that 8½

$$V_0 = \left(1 + \frac{R'}{R}\right)\left(V_1 - \frac{V_2}{A_1}\right) \text{ if } \frac{A_1 A_2 R}{R + R'} >> 1$$

$A_2 \rightarrow$ open loop mode

$V_0 = A_2(V_2 - V_2')$

$A_1 \rightarrow$ open loop mode

$V_2' = A_1(V_1 - V_1')$

$V_1' = \frac{R}{R+R'} V_0$

$V_2' = A_1\left(V_1 - \frac{R}{R+R'} V_0\right)$

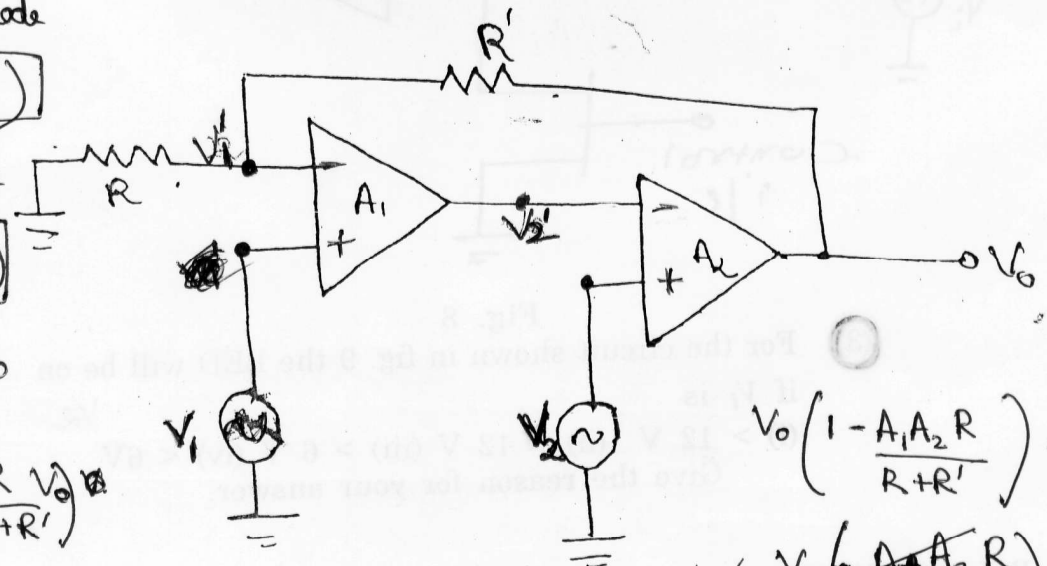

Fig. 10

$V_0 = A_2\left(V_2 - A_1 V_1 + \frac{A_1 R}{R+R'} V_0\right)$

$V_0\left(1 - \frac{A_1 A_2 R}{R+R'}\right) = A_2 V_2 - A_2 A_1 V_1$

$V_0\left(1 - \frac{A_1 A_2 R}{R+R'}\right) = -A_1 A_2\left(V_1 - \frac{V_2}{A_1}\right)$

$V_0 = \left(\frac{R+R'}{R}\right)\left(V_1 - \frac{V_2}{A_1}\right) = \left(1 + \frac{R'}{R}\right)\left(V_1 - \frac{V_2}{A_1}\right)$

(iii) Find the value of the resistances for the circuit shown in **fig. 11**, such that it acts as a full wave rectifier.

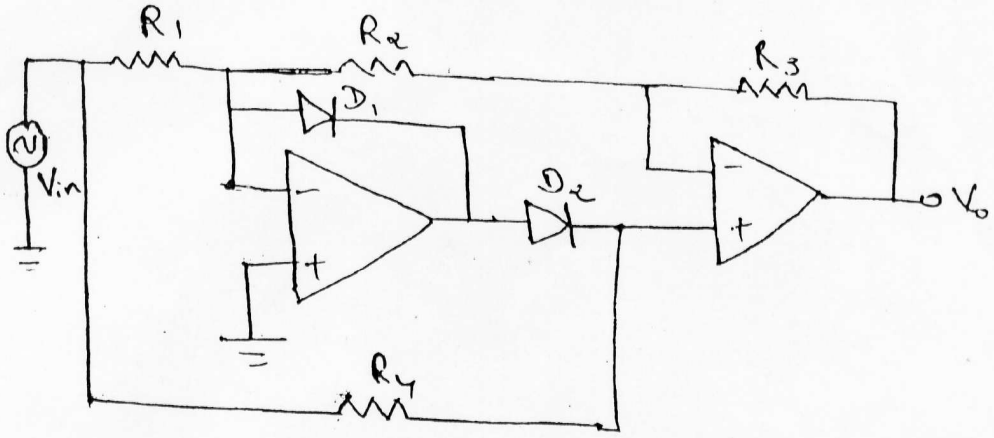

Fig. 11

6 Attempt any **two** : **14**

(1) Derive the equation for frequency of oscillation for triangular wave generator. How one can generate saw tooth wave from the same circuit.

(2) Explain the advantages of an instrumentation amplifier using 3 Op-Amp over conventional operational amplifier. Also derive the necessary equation of the gain for an instrumentation amplifier.

(3) Find V_I, V_N and V_O for the circuit shown in **fig. 12**.

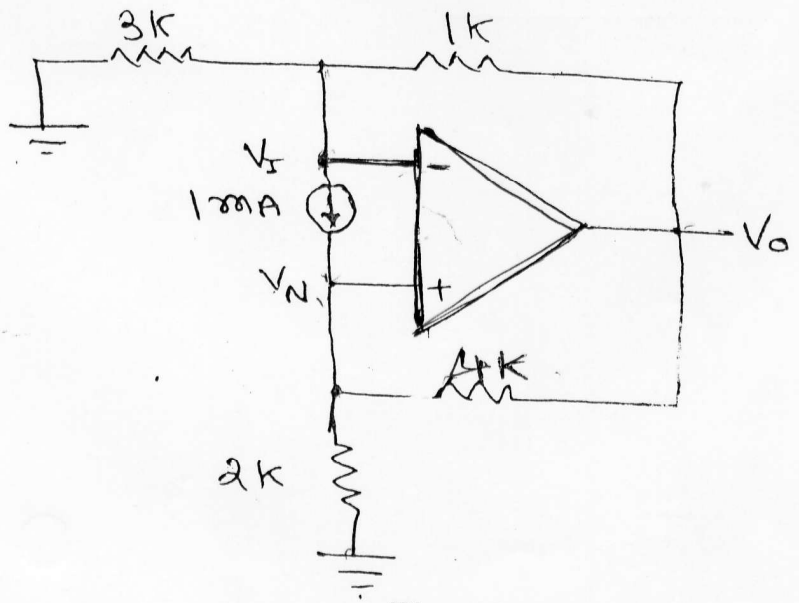

Fig. 12