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# RM-7085-7086

## B. E. III (Sem. VI) (Electronics & Communications) Examination

### May – 2007

## Analog Integrated Circuits (AIC)

Time : 3 Hours] [Total Marks : 100

## RM-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) (ELECTRONICS & COMM.)

Name of the Subject :

☛ Analog Integrated Circuits (AI C)

☛ 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 wherever **necessary**.

1 (a) Write in brief : **10**

(i) Why was the name 'Operational' applied to integrated circuit differential amplifier ?

(ii) State the characteristics of ideal Op-Amp.

(iii) What additional element must he added to convert a narrowband band pass filter to a band reject filter ?

(iv) What is wrong in the following ckt ? Justify.

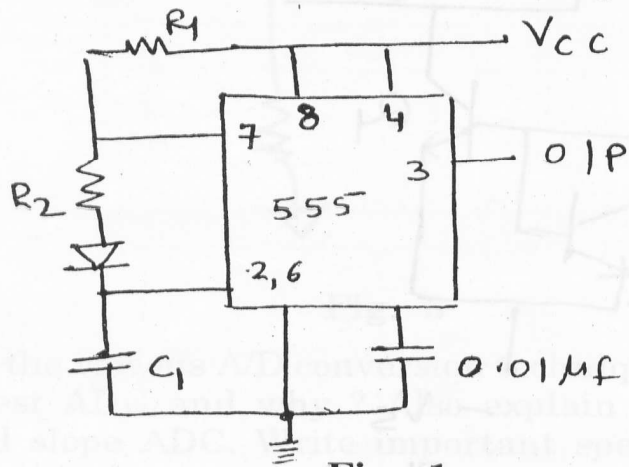


**Fig. 1**

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

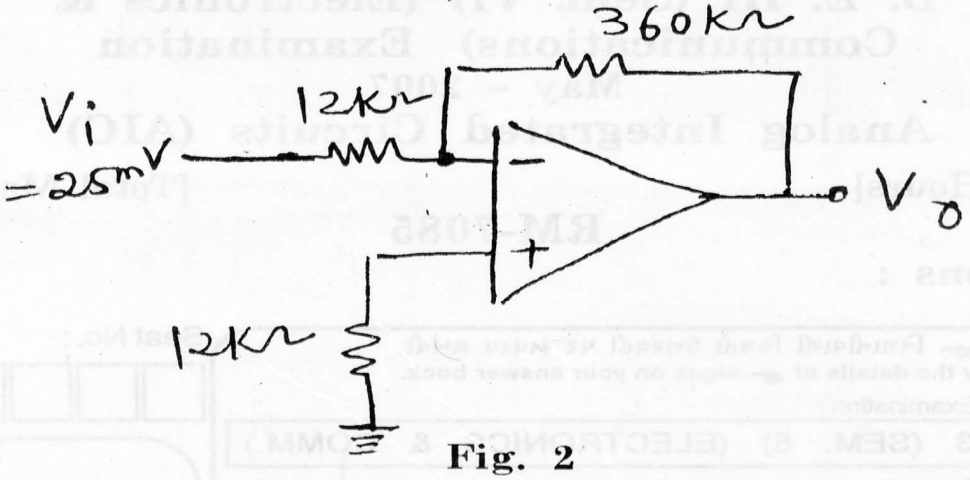


**Fig. 2**

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

$R_i \geq 600\ k\Omega$

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

$V_s = \pm 10\ V$

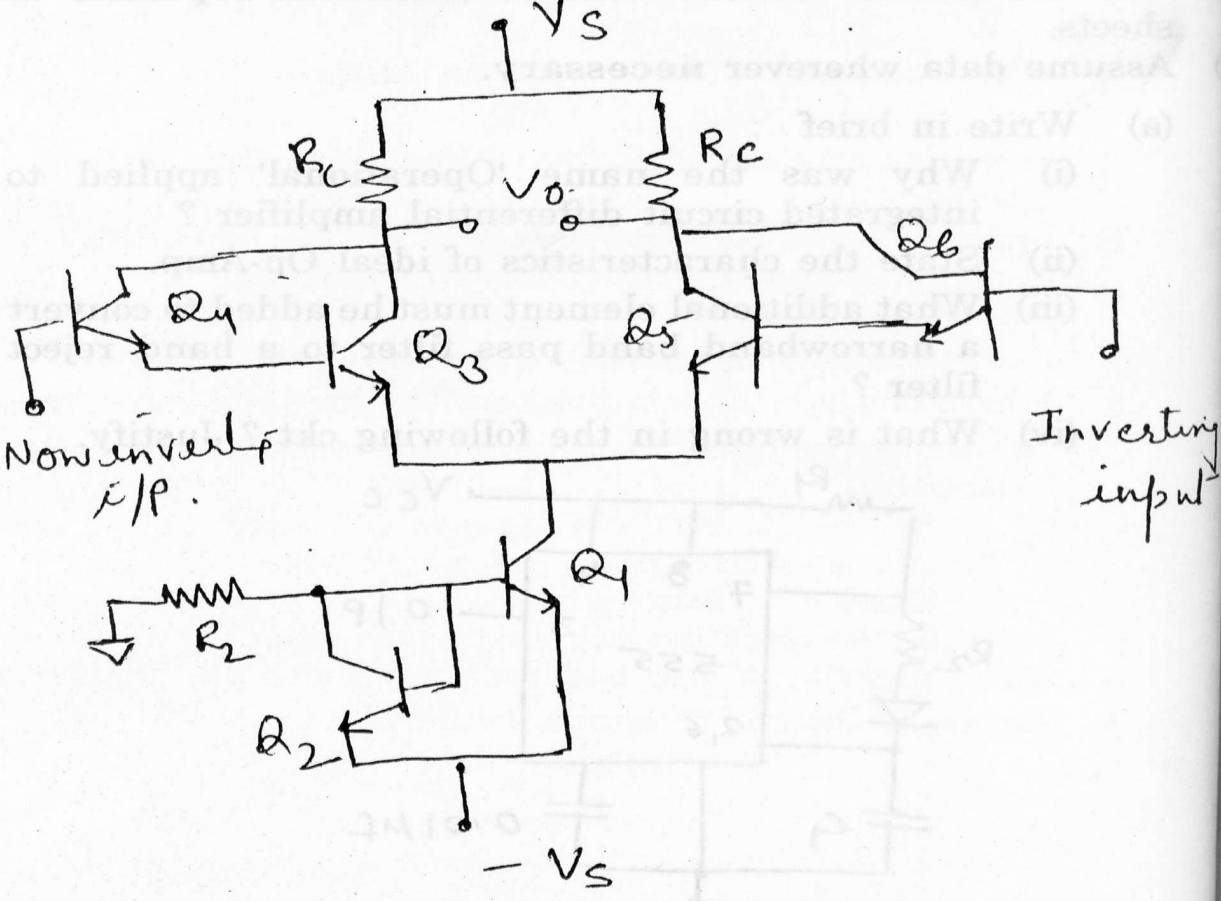


**Fig. 3**

(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.

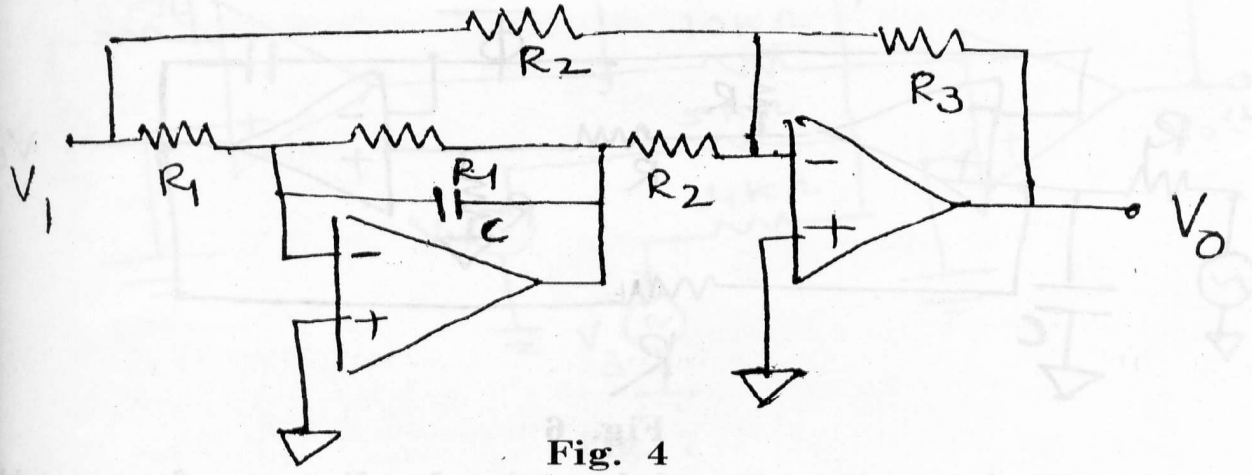


**Fig. 4**

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

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

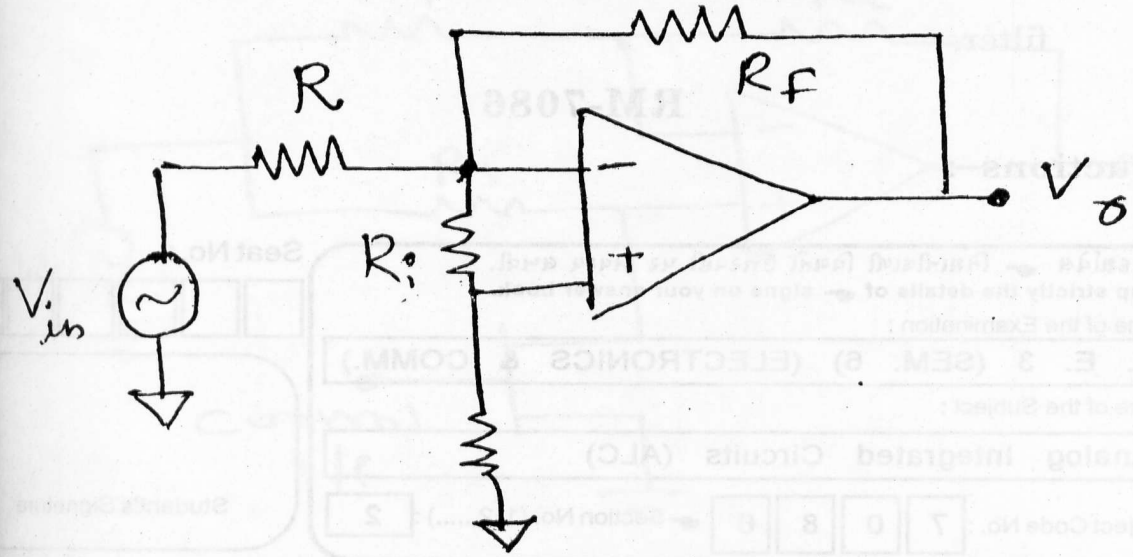


**Fig. 5**

(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

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

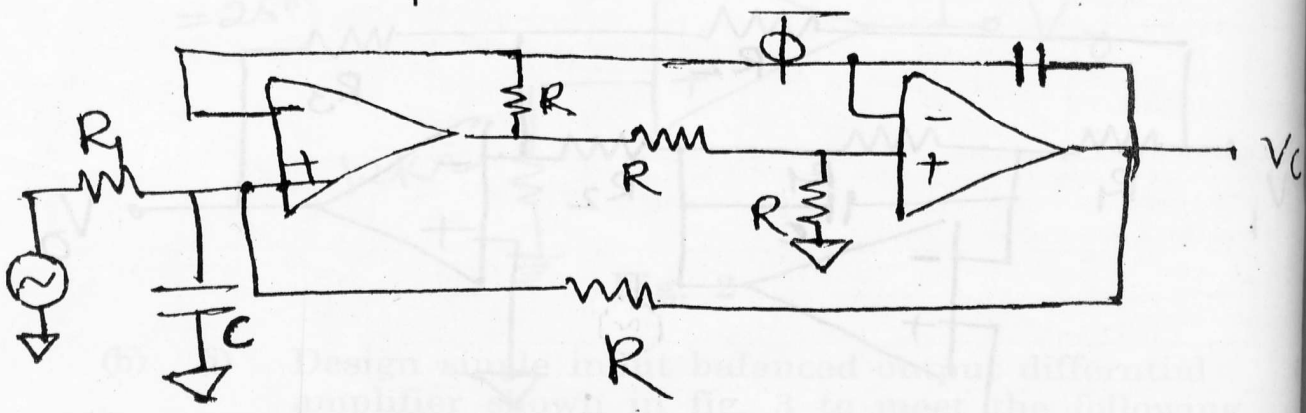


**Fig. 6**

(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**.

4 (a) Attempt the following questions : 10

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

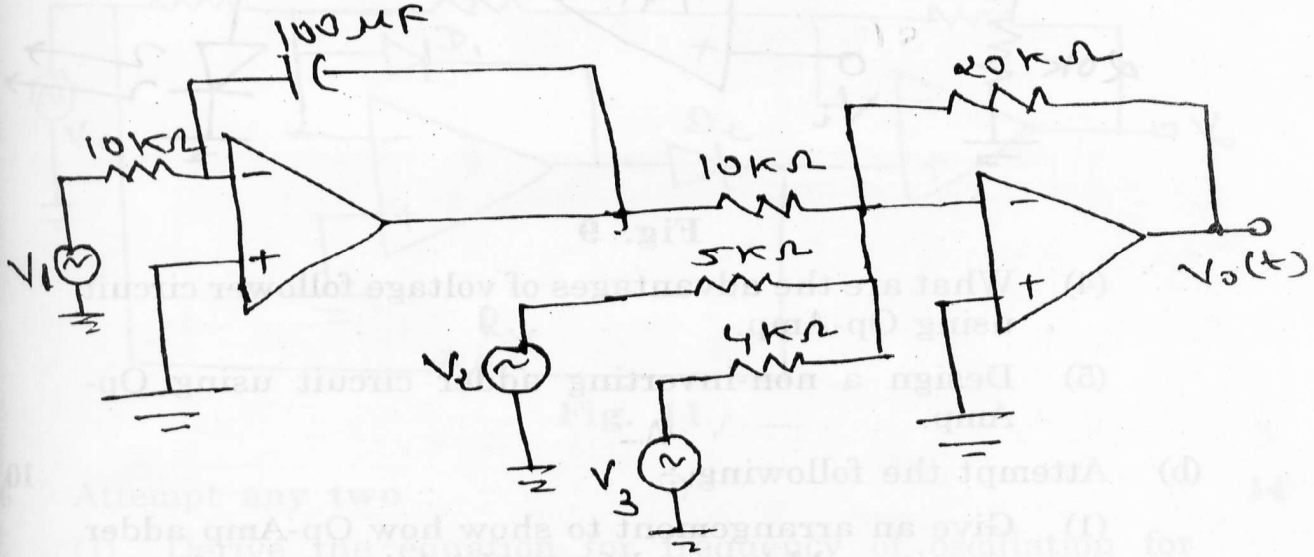


Fig. 7

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

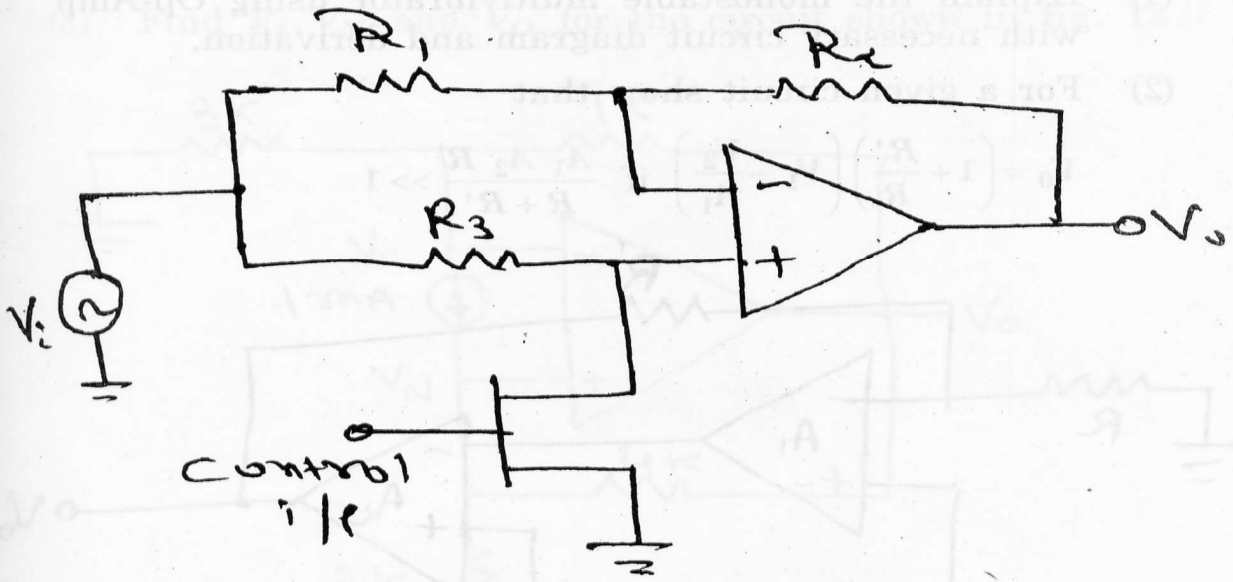


Fig. 8

(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.

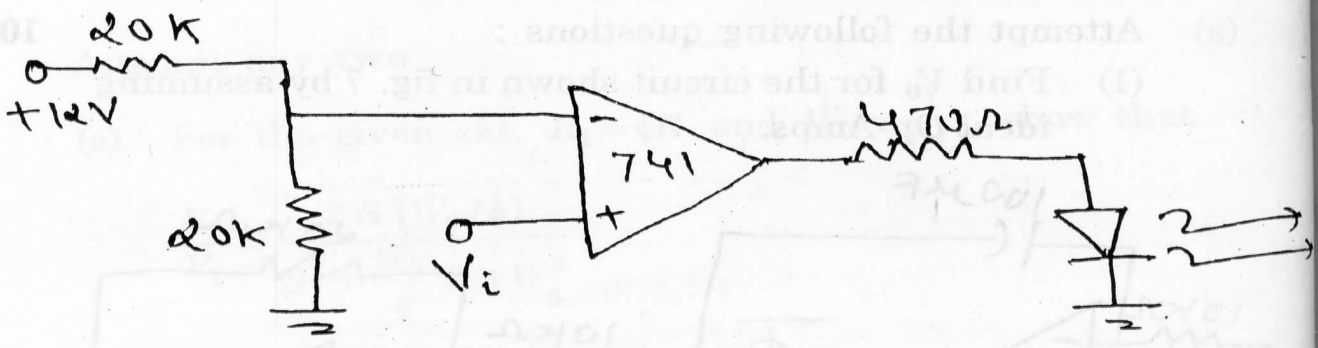


**Fig. 9**

(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.

(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.

(2) For a given circuit show that

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

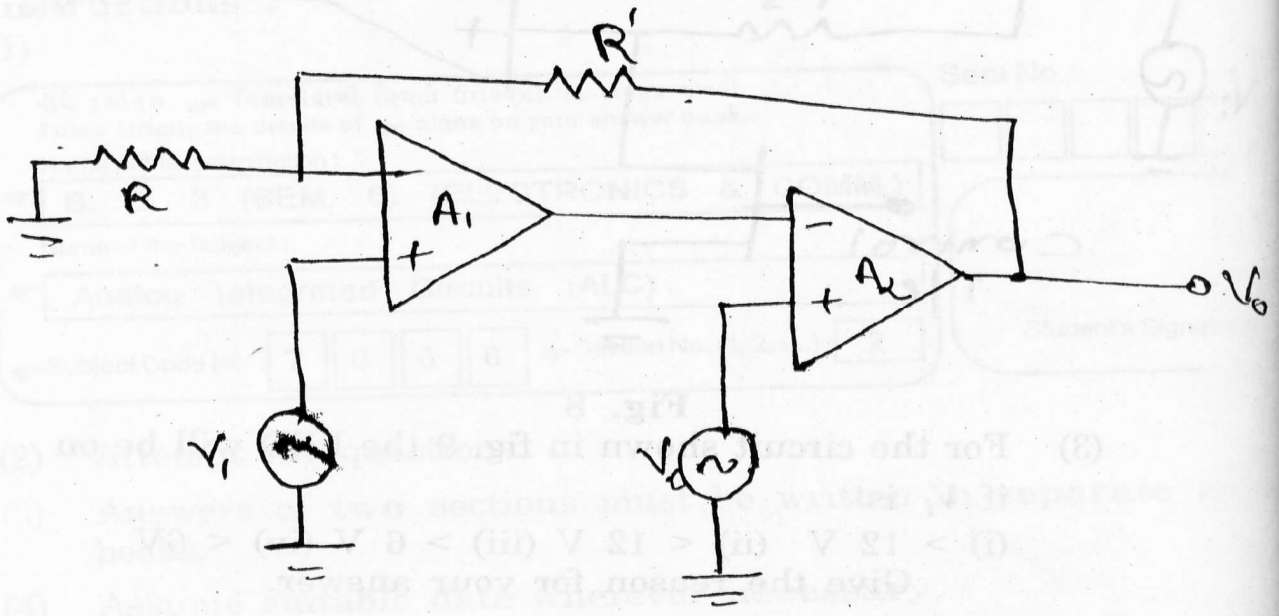


**Fig. 10**

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

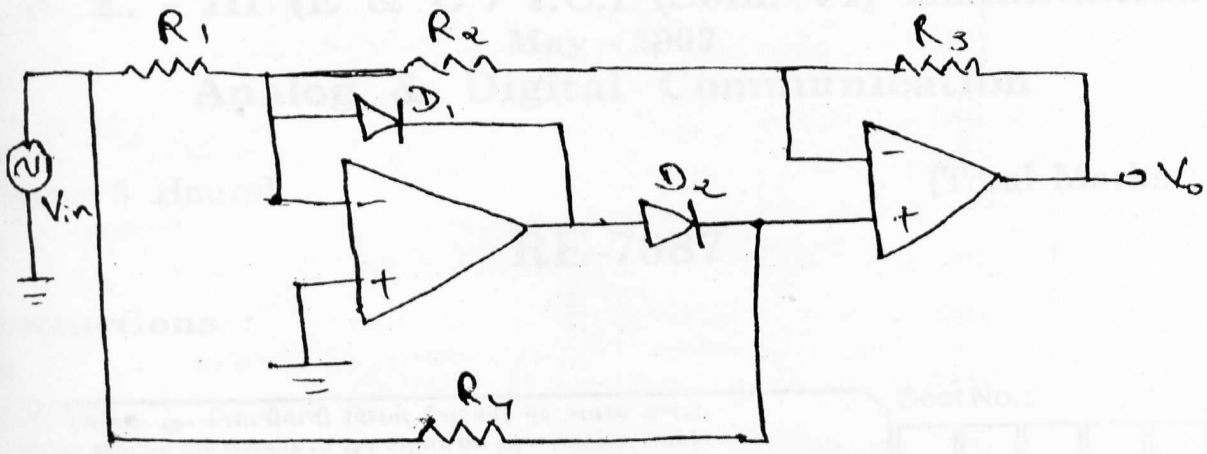


**Fig. 11**

**14**

6 Attempt any **two** :

(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**.

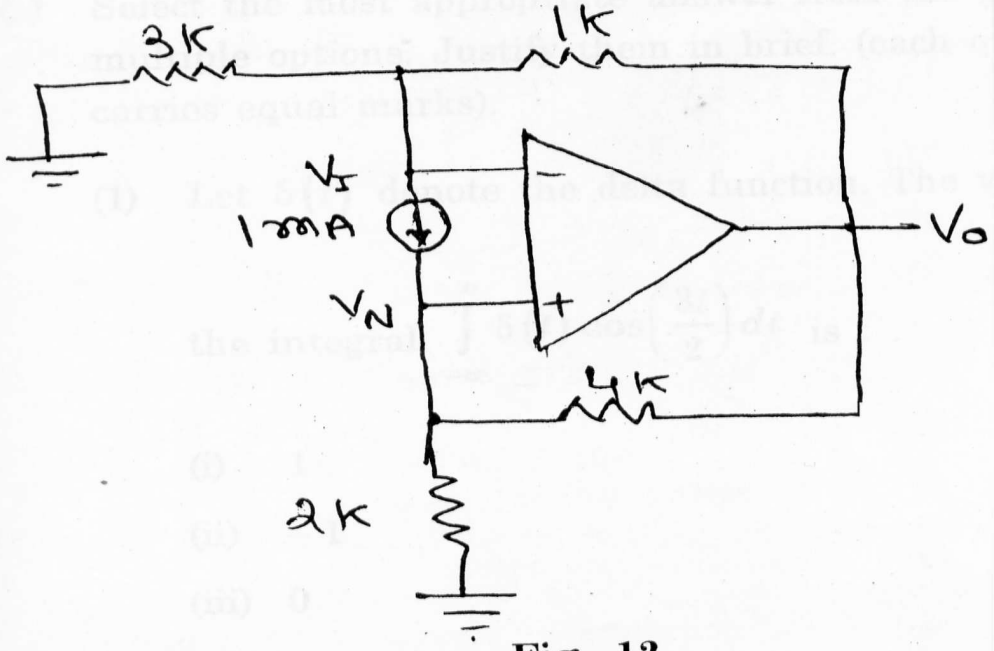


**Fig. 12**