(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3009 Roll No.

B. Tech.

(SEM. V) EXAMINATION, 2007-08

ANALOG CIRCUITS

Time : 2 Hours] *[Total Marks : 50*

Note : *Attempt **all** the questions.*

1. Attempt any **two** of the following questions :

(a) Explain the meaning of open loop and closed loop operation of an OP-AMP. Consider the OP-AMP circuit shown in Fig.1. If the OP-AMP has an open loop gain $A_{OL} = 50000$, what must be the voltage v_i at the non inverting terminal to give an output voltage of 5 V? **2+3**

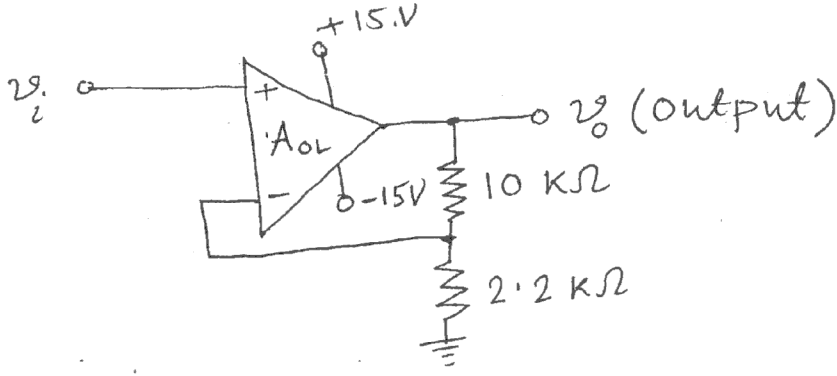

Fig. 1

(b) Explain the difference between the constant current bias and current mirror. 5

(c) Assuming ideal OP-AMP in the circuit shown in **fig. 2**, derive an expression for the output voltage v_0. 5

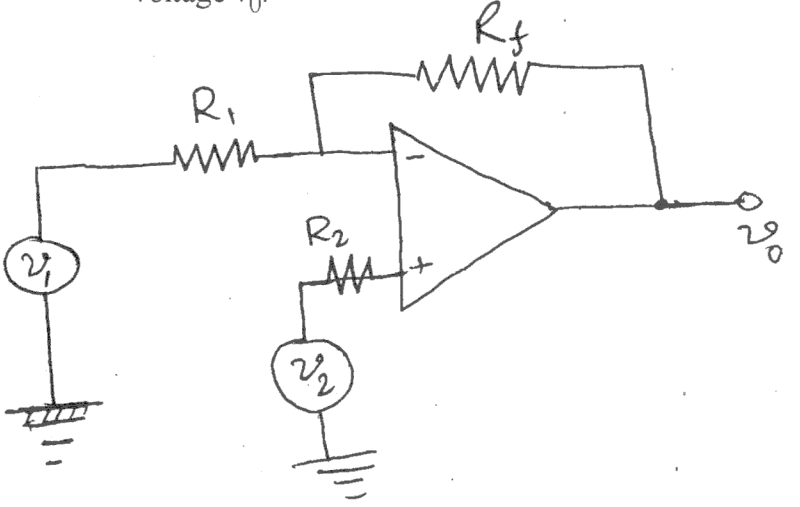

Fig. 2

2. Attempt any **two** of the following questions.

(a) Design an OP-AMP circuit whose output is described by $v_0 = v_1+v_2-v_3-v_4$, where v_1, v_2, v_3 and v_4 are the different input voltages to the circuit. 6

(b) What is an instrumentation amplifier ? For the instrumentation amplifier shown in **Fig.3**, verify that 2+4

$$V_0 = \left(1+\frac{R_2}{R_1}+\frac{2R_2}{R}\right)(V_2 - V_1)$$

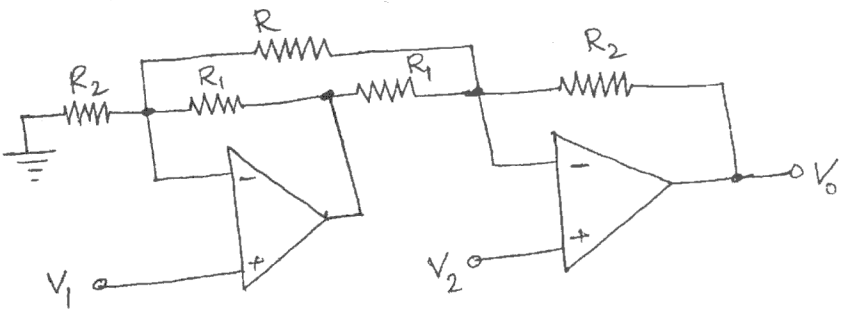

Fig.3

(c) Draw and explain briefly the operation of an RC phase shift oscillator circuit using an OP-AMP. Also derive an expression for the output frequency of the oscillator circuit. **3+3**

3. Attempt any **two** of the following questions :

(a) Draw and explain the operation of a full-wave rectifier circuit using OP-AMP. 7

(b) Describe briefly the operation of a square-wave generator. Also derive an expression for the frequency of the output signal. **4+3**

(c) Draw the block diagram representation of a phase locked loop (PLL). Also describe the basic principle of operation of the circuit. What is the major difference between a digital and an analog PLL? **2+3+2**

4. Attempt any **two** of the following questions :

(a) Discuss the application of operational tranconductance amplifier (OTA) as programmable voltage amplifier and voltage controlled resistor. **4+3**

(b) What do you understand by a regulated power supply? With the help of a suitable circuit diagram, describe the operation of a series regulator using an OP-AMP. 7

(c) List and explain the characteristics of three terminal IC regulators. What are the limitations of the tree terminal regulators ? 5+2
