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

PAPER ID : 3086 Roll No.

B.Tech.

FIFTH SEMESTER EXAMINATION, 2006-07

ANALOG INTEGRATED CIRCUITS

Time : 3 Hours *Total Marks : 100*

Note : *(i) Attempt **ALL** questions.*

(ii) All questions carry equal marks.

(iii) In case of numerical problems assume data wherever not provided.

(iv) Be precise in your answer.

1. Attempt *any two* parts of the following : **(10x2=20)**

(a) Obtain CMRR for the circuit shown in Fig.1(a)

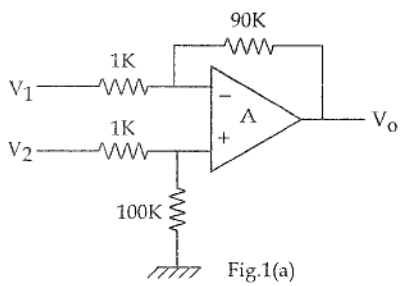

Fig.1(a)

(b) Obtain I_{C2} in terms I_R of Fig.1(b) assuming all transistors are identical.

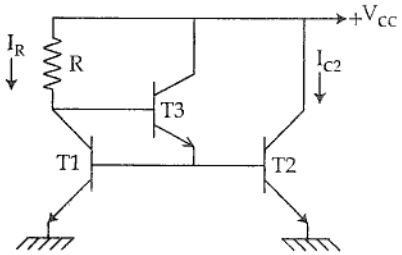

Fig.1(b)

(c) (i) When will the output get saturated in Fig.1(c) ?

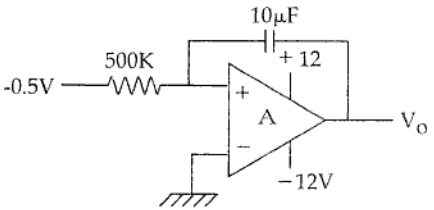

Fig.1(C)

(ii) A peak to peak input signal of 0.5V has to produce a peak to peak undistorted output voltage of 3V with a rise time of 4μs. Can 741 Op amp be used for such an application. Explain your answer.

2. Attempt *any two* parts of the following : (10x2=20)

(a) Why timer IC was given the name IC 555 ? What are its essential building blocks ? Explain them.

(b) Explain the difference between capture and lock range of frequencies of the PLL with suitable examples.

(c) Calculate the amplitude of the triangular wave and square wave for Fig.2(c).

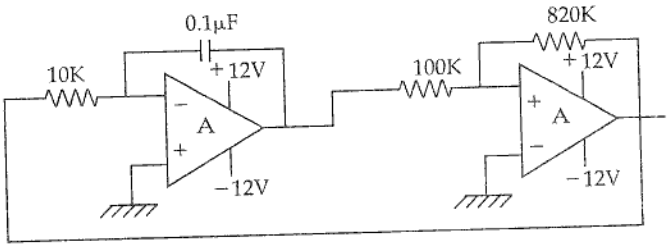

Fig.2(C)

3. Attempt *any two* parts of the following : **(10x2=20)**

(a) Enumerate advantage of active filters w.r.t. the passive filters. Why and how many sections are required for a composite passive filter ?

(b) Obtain 3dB frequency for Fig.3(b) and explain state variable filter.

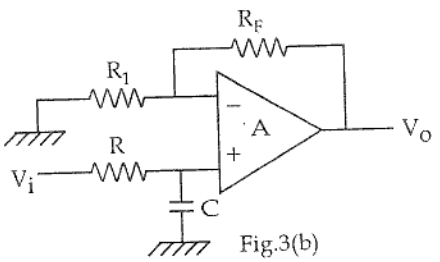

Fig.3(b)

(c) Draw the circuit of a second order low pass filter and obtain its voltage transfer function.

4. Attempt *any four* parts of the following : **(5x4=20)**

(a) What are advantages of a Crystal Oscillator ? Draw equivalent circuit of the piezoelectric crystal and show how its impedance varies with frequency.

(b) Obtain frequency of oscillation for Fig.4(b).

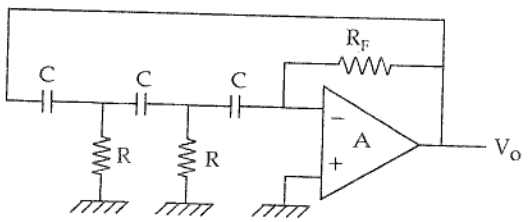

Fig.4(b)

(c) Show that the slope of the wave obtained at the output of Fig.4(c) is proportional to the charging voltage and inversely proportional to the RC time constant. How Fig.4(c) can be converted to a practical integrator ? Find out its limiting frequency.

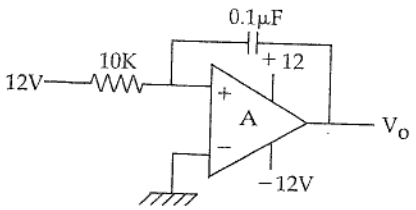

Fig.4(C)

(d) Why do we need Precision Rectifier ? Draw and explain how a precision rectifier works.

(e) Obtain an expression for the output of a Logarithmic Amplifier.

(f) Determine the threshold voltages and the hysteresis voltage of the Schmitt's Trigger circuit shown in Fig.4(f).

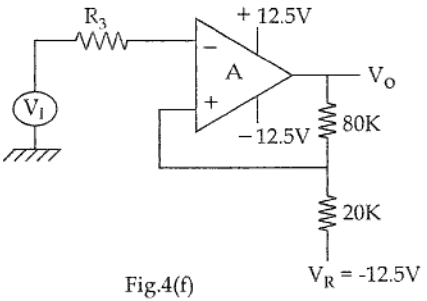

Fig.4(f)

5. Attempt *any four* parts of the following : **(5x4=20)**

(a) Draw and obtain an expression for the time period of a Astable Multivibrator using Op.Amp.

(b) Show that an OTA can be used as a Modulator.

(c) Draw and explain the difference between series and shunt regulators.

(d) Obtain load current I_L, If $I_{in} = 100mA$, $I_o = 1A$ and $\beta = 20$ for fig.5(d).

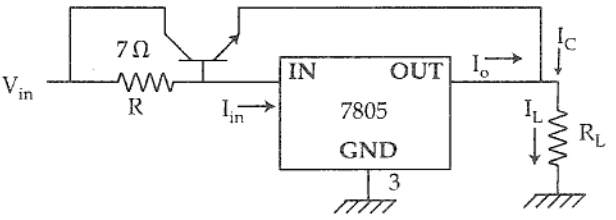

Fig.5(d)

(e) How SMPS is different from a regulated power supply ? Draw the circuit and explain its working principles.

(f) Obtain voltage transfer function for the circuit shown in fig.5(f).

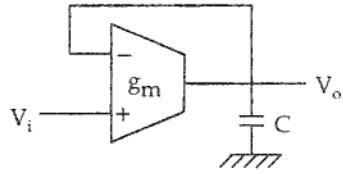

Fig.5(f)

- o O o -