Total No. of Questions—**12**] [Total No. of Printed Pages—**4+2**

[4062]-162

S.E. (Instru. Engg.) (I Sem.) EXAMINATION, 2011

LINEAR INTEGRATED CIRCUITS—I

(2008 PATTERN)

Time : Three Hours **Maximum Marks : 100**

N.B. **:—** (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

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

(*iv*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (A) How Noise Figure (NF) is associated with signal power and noise power ? State the equation. [4]

(B) What is inherent noise ? (With reference to Op-amp.) [2]

(C) What is interference noise ? [2]

(D) How are these tackled with Op-amp ? [4]

(E) Match the *correct* pairs : [6]

N_{rms}	$K\left(\sqrt{1/f}\right)$
Resistance Noise (*e*)	$\sqrt{\frac{1}{T} \int h_i^2 \, dt}$
Pink Noise	$\sqrt{4KTR}$

P.T.O.

Or

2. (A) How to measure input resistance of an op-amp (IC-741) in non-inverting mode ? Let voltage gain be equal to 1.0. Explain with neat circuit diagram. [8]

(B) How to measure input bias current in a closed loop circuit using IC 741 ? Explain with circuit diagram. [8]

(C) Use of step up transformer decreases signal power. State True *or* False. [2]

3. (A) Refer the amplifier circuit (Refer Fig. 1), Q_1 and Q_2 are identical transistors. How does this circuit work ? Two cases of inputs are given :

Case 1 : $V_{in1} = +V_P$ (+ve peak voltage), $V_{in2} = 0$

Case 2 : $V_{in2} = +V_P$, $V_{in1} = 0$.

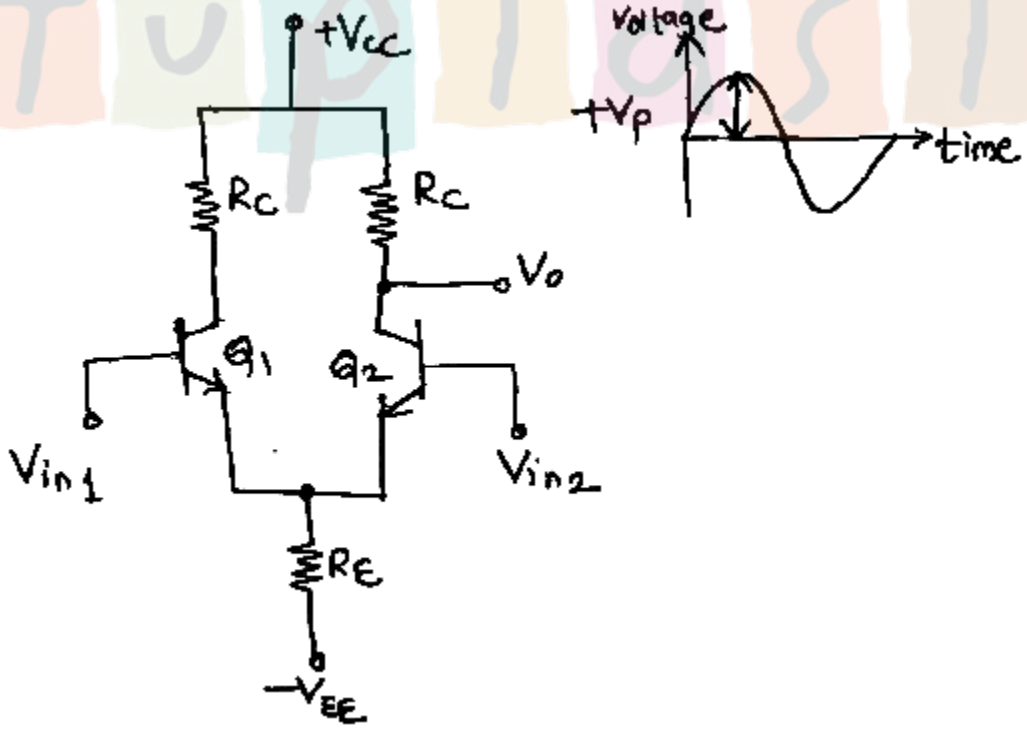

Fig. 1

Also draw waveform V_o with respect to V_{in1} and V_{in2}. [10]

(B) How op-amp acts as buffer amplifier ? Where is it used ? Explain. [6]

Or

4. (A) For inverting and non-inverting op-amps; derive the equations of voltage gain. [10]

(B) Draw neat circuit diagrams for both parts of question A. [6]

5. (A) Why external feedback resistor R_F is inserted in practical integrator circuit using op-amp ? [4]

(B) Why external feedback capacitor C_F is inserted in practical differentiator circuit using op-amp ? [4]

(C) Why external input resistor R_i is inserted in practical differentiator ? Explain. [4]

(D) State the limitations of op-amp practical differentiator. [4]

Or

6. (A) Let V_{CC} = +/– 15 Volts DC. Two stages of non-inverting amplifiers are connected as shown (Refer Fig. 2) :

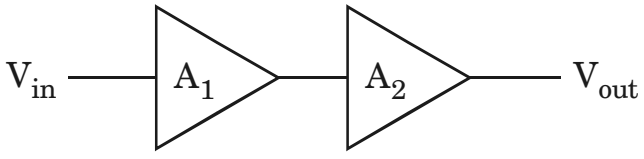

Fig. 2

Let $A_1 = A_2 = 6$.

For given inputs calculate output voltage V_{out}.

V_{in}	V_{out}
10 milli-volts	?
50 milli-volts	?
+1 volts	?
–1.5 volts	?

Show calculations for each answer. [8]

(B) Write a short note on Instrumentation amplifier. [8]

SECTION II

7. (A) Design a Schmitt trigger for the given data :

$V_{UT} = V_{LT} = 2.5$ volts.

Let saturation voltage = +/– 12 volts. Show the calculations with circuit. [10]

(B) An open loop circuit using op-amp has inputs connected as shown in table below; show the calculations for output voltages V_{CC} = +/– 15 volts. [8]

Pin 2 voltage	Pin 3 voltage	V_{output}
+2 Volts DC	+1 Volt DC	?
+1 Volt DC	+2 Volts DC	?
1 Volt peak to peak sine wave 100 Hertz	Zero volt	Draw input-output waveforms

Or

8. (A)

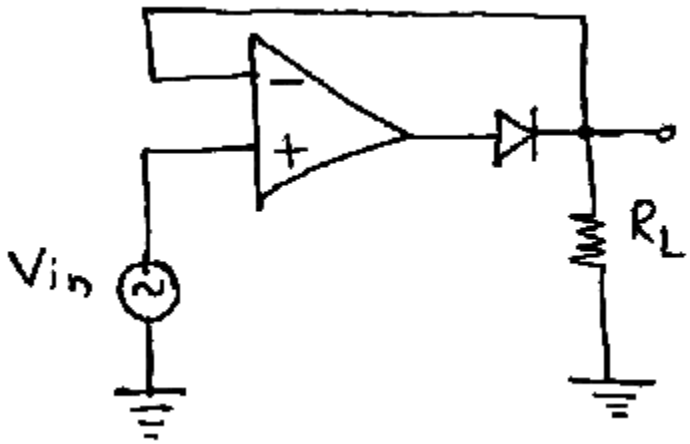

Fig. 1

Why 741 op-amp and diode 1N4007 is not preferred in the above (Refer Fig. 3) precision half wave rectifier ? Explain. [6]

(B) State Barkhausen criteria. [4]

(C) Explain how Wien Bridge oscillator works with circuit diagram. [8]

9. (A) State the equation for time required for a capacitor to charge through a resistor R from some starting voltate (V_{START}) towards Aiming voltage (V_{aim}) to a stop voltage (V_{stop}). [4]

(B) How much current (maximum) can be drawn from IC 555 ? [2]

(C) How astable multivibrator using IC 555 is designed ? Explain. [8]

(D) Enlist pin names of IC 555. [2]

Or

10. (A) Draw a neat circuit diagram with transformer, rectifier, IC 7805, filter capacitors that will generate +5 Volts DC. [8]

(B) Write a short note on switching regulators. [8]

11. (A) Draw frequency responses of ideal Low Pass, High Pass, Band Pass, Band Reject filters. [8]

(B) Draw practical frequency responses of above filters. [8]

Or

12. (A) How order of a filter is decided ? [2]

(B) What is the effect of order of filter on filter response ? [2]

(C) What are the design steps of a first order high pass filter ? [6]

(D) How to design a band pass filter ? [6]