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T.E. (Electronics and Industrial Electronics) (Semester – II) Examination, 2009
LINEAR INTEGRATED CIRCUITS
(1997 Course)

Time : 3 Hours　　　　Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*6) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Discuss with the help of block schematic the principle of operation of PLL.
   b) Explain the terms "Lock range" and "Capture range". State the factors governing these ranges.
   c) Draw a circuit of typical "voltage controlled oscillator" and explain its operation. **18**

2. a) For the circuit shown in fig. (a)
   1) Find V_0/V_{in} for $V_{in} > 0$
   2) Find V_0/V_{in} for $V_{in} < 0$
   3) Derive the condition so that V_0/V_{in} is same in both half cycles. **10**

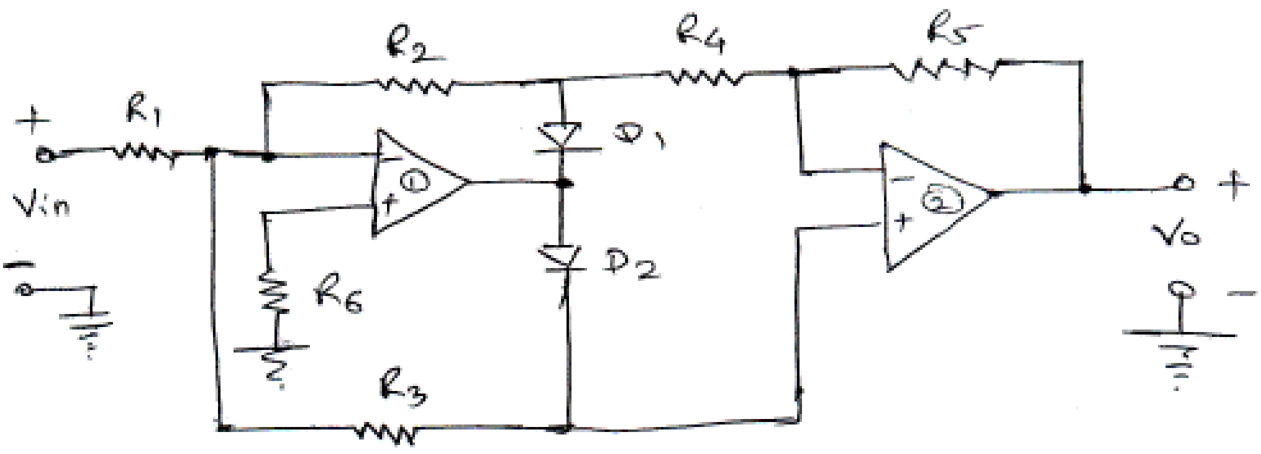

Fig. (a)

P.T.O.

b) 1) Describe the function of the circuit shown in fig. (b)

2) Draw the waveforms at various points for positive V_{ref}. **6**

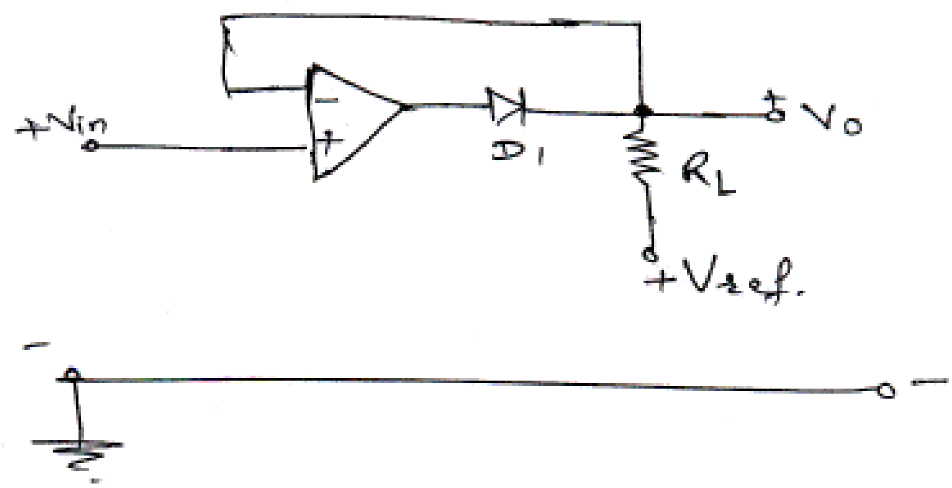

Fig. (b)

3. a) Draw a neat circuit diagram of a peaking amplifier. Label the components properly. Assume that the inductor used has a series resistance R_s. **2**

b) Derive the expression for its parallel equivalent resistance R_p. **2**

c) Derive the expression for its parallel equivalent inductance L_p. **2**

d) Hence derive the expression for the voltage gain $A_V(j\omega)$ of the peaking amplifier. **4**

e) Hence derive the expression for the peak voltage gain Avo. **2**

f) Find out the Q coil as a function of frequency. **2**

g) Find out the Q coil at a peaking frequency. **2**

4. a) Explain with internal circuit diagram working of Norton amplifier in inverting mode. **6**

b) Design an inverting Norton amplifier for a gain of 12 using LM3900. Use 9v single power supply. Input impedence be 100 kΩ s. Assume source impedence zero ohms, lower cutoff frequency 100 Hz, and load impedance of 20 kΩ s. **10**

5. Write short notes on (**any two**) : **16**

a) Programmable gain amplifier

b) PID controller

c) Schmitt trigger

d) Sample and hold circuit.

SECTION – II

6. a) Explain I to V converter with the help of an application for D to A converter. **8**

b) Derive an expression for output voltage of a Log-ratio amplifier and explain its working with help of circuit diagram. **8**

7. a) Explain the need of linearization of signals from transducers.
Discuss in short any two techniques of linearization. **8**

b) What are the sources of common mode noise ? Explain how instrumentation amplifier help to reduce this noise. **8**

8. a) Derive the expression for i_L for the circuit shown in fig. (c). **8**

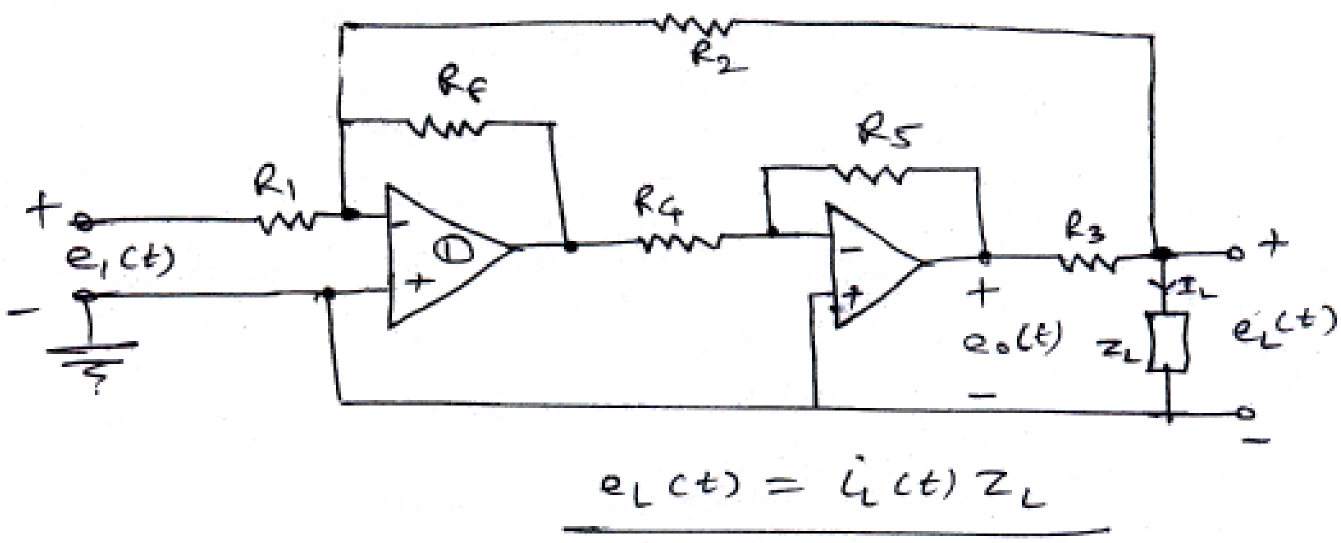

Fig. (c)

b) With a neat diagram, describe the operation of IC LM 2907 as a frequency to voltage converter. **8**

9. a) Using IC 7805 (Three terminal regulator) design a current source to deliver op-amp current to 20Ω, 10 watts load. **8**

b) What are the advantages of using active loads in op-amp circuits ? **2**

c) Explain how temperature dependent reverse saturation current gets eliminated by using logarithmic ratio amplifier. **6**

10. Write short notes on (**any three**) : **18**

a) Power amplifier IC

b) PLC and FSK demodulator

c) Graphic equalizer

d) Wein bridge oscillator

e) Function generator using ICL 8038.

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T.E. (Electronics) (Sem. – II) Examination, 2009
NETWORK THEORY
(1997 Course) (Old) (Common to I.E.)

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer **any 3** questions from **each** Section.*
*2) Answers to the **two** Sections should be written in **separate** books.*
*3) **Neat** diagrams must be drawn **wherever** necessary.*
*4) Black figures to the **right** indicate **full** marks.*
*5) Your answers will be valued as a **whole**.*
*6) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is **allowed**.*
*7) Assume suitable data, if **necessary**.*

SECTION – I

1. a) Explain following terms with reference to the graph theory.
   1) Planar and non-planar graph.
   2) Tree and cotree.
   3) Incidence matrix.
   4) Fundamental cut set matrix.
   5) Fundamental loop matrix. **10**

   b) Compare time domain analysis with frequency domain analysis. Give advantages of the Laplace transform analysis. **6**

2. a) What are even signal and odd signals ? Resolve following signals into even parts and odd parts. **10**

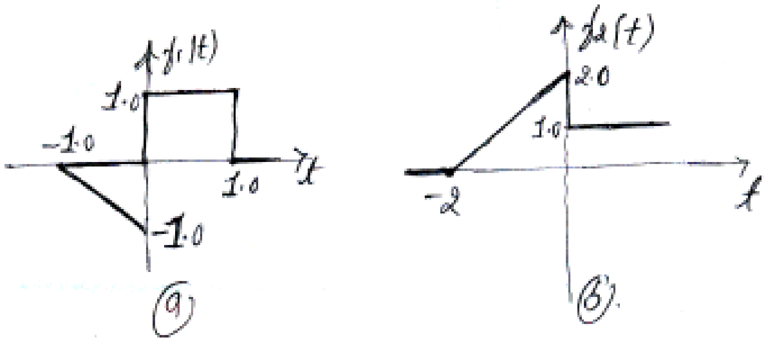

Fig. 1

   b) Give six important properties or theorems on Laplace Transform. **6**

3. a) What are unit impulse, unit step and unit ramp functions ? Establish relationship between them. **6**

b) Find the Laplace Transform of following waveforms shown in Fig. 2. **8**

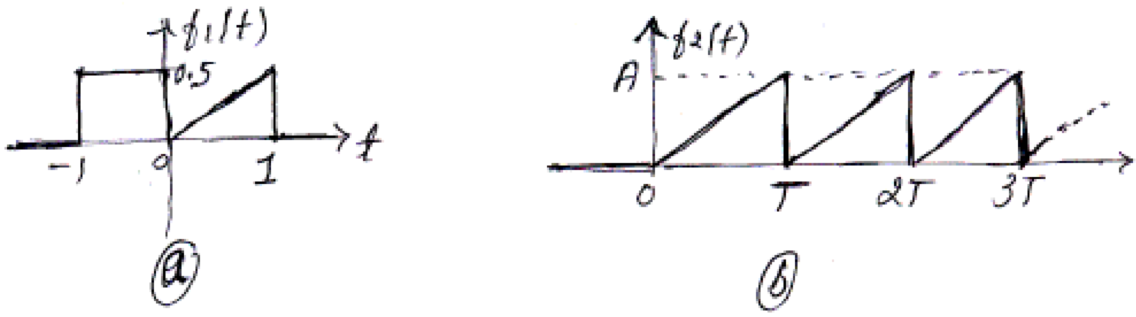

Fig. 2

c) Find the Inverse Laplace Transform of **4**

$$F(s) = \frac{(1 + e^{-3s})}{s^2 (s + 2)}$$

4. a) In the R-L circuit shown in Fig. 3 switch was on position 1 for a long time and steady state is reached. At t = 0 it is thrown on position 2. Find the resultant current $i_1(t)$ using L.T. method. **8**

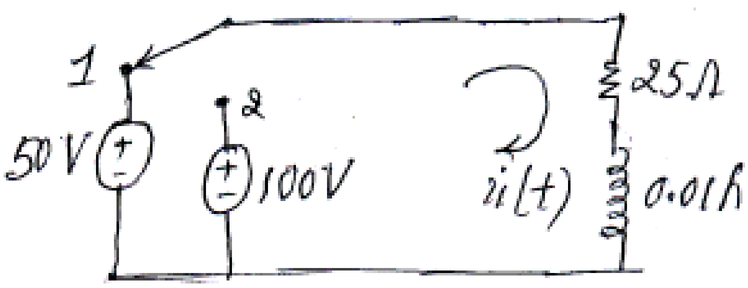

Fig. 3

b) For the network shown find the following network functions.

$$\alpha_{21}(s) = \frac{I_2(s)}{I_1(s)},\ G_{21}(s) = \frac{V_2(s)}{V_1(s)},\ Z_{21}(s) = \frac{V_2(s)}{I_1(s)}.$$ **8**

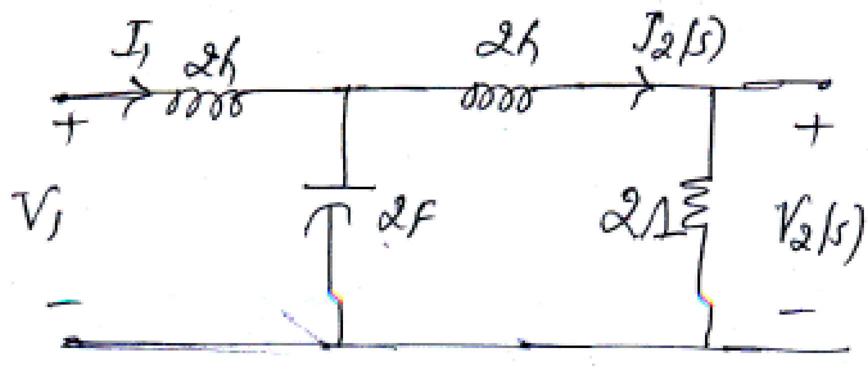

Fig. 4

5. a) Find the residues at the poles of the function using graphical method and then find Inverse Transform. **8**

$$F(s) = \frac{(s+2)(s+2)}{s(s^2+4)}$$

b) Write a brief short note on : **8**

1) Incidental dissipations
2) Poles and zeros.

SECTION – II

6. a) What are network parameters ? With equations explain Z and T parameters. Obtain T-parameters in terms of Z-parameters. **8**

b) Find Z and Y parameters for the circuit shown in Fig. 5. **8**

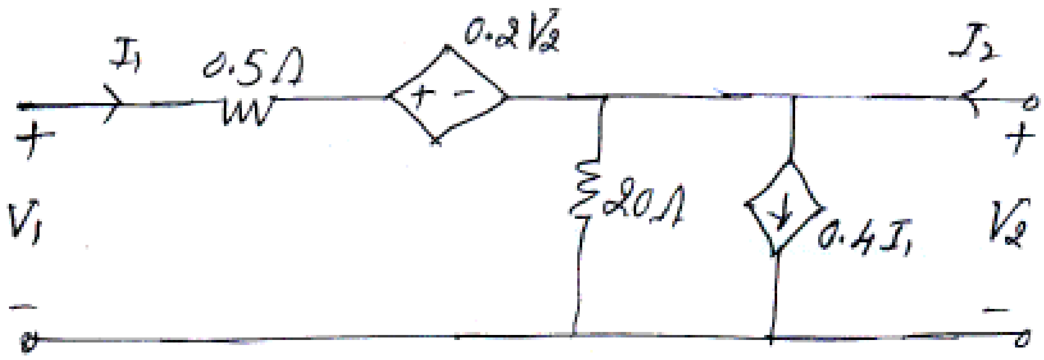

Fig. 5

7. a) Explain necessary and sufficient conditions for a function to be Positive Real function. **4**

b) What is Hurwitz polynomial ? Test whether following function is Hurwitz. **6**

$P(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$

c) Test whether following functions are prf **8**

1) $F_1(s) = \dfrac{s^2 + 6s + 5}{s^2 + 9s + 14}$ 2) $F_2(s) = \dfrac{2s^2 + 2s + 4}{(s+1)(s^2+2)}$.

8. a) Give the properties of driving point L-C impedance functions. **4**

b) Realize following function into Cauer – I and Cauer – II forms. **8**

$$Z(s) = \frac{s^4 + 10s^2 + 9}{s^3 + 4s}$$

c) Realise following function into Foster – II form **4**

$$Y(s) = \frac{s(s+2)}{(s+1)(s+4)}$$

9. a) Synthesize following function into L-C ladder network with 1s termination. **6**

$$Z_{21}(s) = \frac{s^3}{s^3 + 3s^2 + 4s + 2}$$

b) Compare Butterworth and Chebyshev filter approximations. **4**

c) Design a I[st] order B.W. active filter having a passband gain of 20 dB and cutoff frequency of 2 KHz. **6**

10. a) Write short note on : **8**

1) Impedance scaling and frequency scaling.
2) Gyrator and its applications.

b) Realize a normalized LP Butterworth filter having following specifications. **8**

1) Passband specification of $|H(J0.5)|^2 > 0.9$
2) Stop band specification of $|H(J2)|^2 < 0.01$
3) $R_s = R_o = 1$ ohm.
