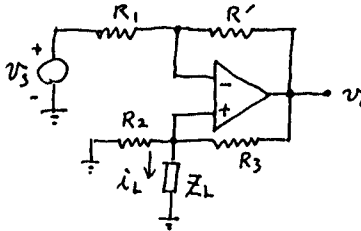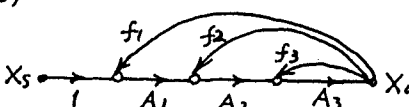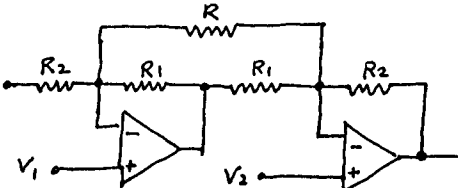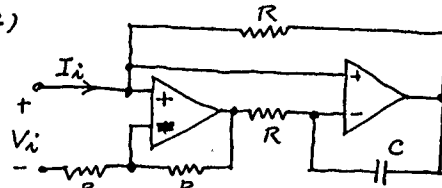一.(1) Consider the 8 kb ROM with 8 output bits. If the memory matrix has 128

20%   rows, how many bits are needed for (a) the X address ? (b) the Y address ?

(c) Repeat (a) and (b) assuming that there are 64 rows in the encoder.

(d) How many words does this ROM have and how many bits are needed to decode these words ?

(2) Two 16 kb (2048 × 8) ROMS are available. Show how to connect these so as to obtain (a) a 32 kb (2048 × 16) ROM and (b) a 32 kb (4096 × 8) ROM.

二. (1)

16%

In the left-side figure, for an ideal OP-AMP, verify that i_L equals V_3/R_2 if R_3/R_2 equals R'/R_1.
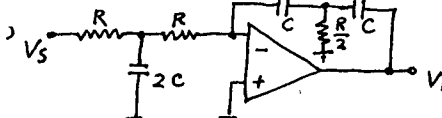
(2)

For the multiloop circuit shown in the left-side figure, let $A_1 = a_1/(1+\tau_1 s)$, $A_2 = a_2/(1+\tau_2 s)$ and $A_3 = a_3/(1+\tau_3 s)$. f_1, f_2, f_3 are real constants. Obtain the transfer function $A_F(s)$.

三.

16%

For the instrumentation amplifier shown,

(a) Verify that $V_0 = (1 + \frac{R_2}{R_1} + \frac{2R_2}{R})(V_2 - V_1)$

(b) determine the CMRR

四. (1) An OP-AMP has a slew rate of 50 V/μs. (a) What is the maximum

16%   frequency of an output sinusoid of 5 V peak value before slew-rate distortion exists ? (b) Repeat (a) for a 15 V signal.

(2)

For the gyrator shown in the left-side figure, Show that V_i/I_i is inductive. Assume ideal OP-AMPs.

五.   Draw the block diagram and explain the operation for (a) a flash A/D

16%   Converter, (b) a dual slope A/D converter.

六. (1)

For the circuit shown in the left figure,

16%   prove that $V_0/V_s = -1/(RCs)^2$.

(2) An amplifier must dissipate 15.1 W of internal power. The ambient temperature is $T_A = 30°C$. If the maximum allowable junction temperature is $T_{J(max)} = 150°C$ and if $\theta_{JC} = 3°C/W$, what is the maximum heat-sink thermal resistance θ_{SA} (sink-to-ambient) that can be tolerated ?