2018

LINEAR INTEGRATED CIRCUIT

Paper : EC 403

Time : Three hours

Full Marks : 100

The figures in the margin indicate full marks for the questions.

Answer any five questions.

1. (a) Describe the astable operation using 555 timer IC with proper circuit diagram and waveforms. Hence mention the time period of the o/p wave.

8+2

(b) Design an Active LPF (Butterworth 1st order) with pass band gain of 60dB and 10kHz Bandwidth.

5

(c) Why level shifters are necessary in integrated circuits explain with proper reasoning ?

5

2. (a) Mention the different operating modes of PLL. Describe the different blocks in a PLL system with proper circuit diagram and operation. 2+8

(b) Draw the circuit diagram of an inverting Schmidt trigger circuit and describe its operation and draw the voltage transfer characteristics. 8+2
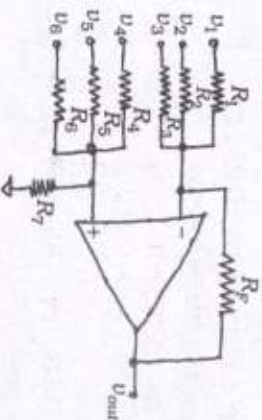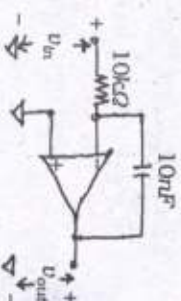
3. (a)

Fig. 1

Prove that the output voltage for the circuit shown in Fig. 1 will

$$v_{out} = -v_1 - v_2 - v_3 + v_4 + v_5 + v_6$$

if all resistances are equal. 6

(b) An input pulse of height 1V (0 – 1V) has a pulse width of 1msec, is applied to the integrator in Fig. 2. Draw the input and output waveform. 4

Fig. 2

(c) Derive the differential gain expression for a dual-input differential output Amplifier. 10

4. (a) Define the different types of multivibrators and discuss the internal block diagram of a 555 timer IC and functionality of each pin. 2+10

(b) Derive the expression for the crypt voltage for the circuit shown below: 8
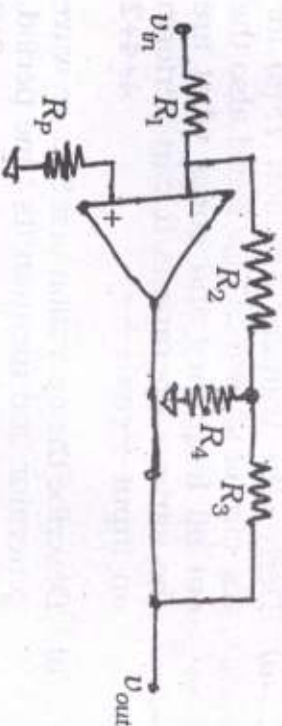
5. (a) Explain the op-Amp in negative feedback can be used for I-V and V-I converter and hence derive the expression for respective sensitivity parameters and mention the applications of these two converters. 5+5
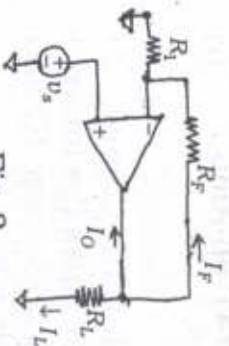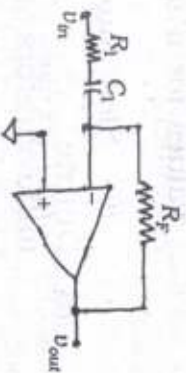
(b)

Fig. 3

Derive the expression for load current 'I_L' and 'I_O' in terms of v_s for circuit shown in *Fig.* 3.

5+5

Fig. 4

6. (a) Derive the transfer function *TF*(s) for the circuit shown in *Fig.* 4 and also the cut off frequency and guess what are the various operations it can perform on input signal.

4+4+2

(b) Describe the operation of a Square-wave generator and mention its time period.

8+2

7. (a) Draw the simplified internal schematics of a 741 op-Amp and specify the label for each stage.

6

(b) Mention the features of an instrumentation amplifier and derive the expressions for its gain.

2+4

(c) Define following terms and write the values for a μA 741 op-Amp :

(i) Slew Rate

(ii) CMRR

(iii) Offset voltage

(iv) PSRR.

4×2