

Total number of printed pages-4

53 (EC 403) LICR

2019

## LINEAR INTEGRATED CIRCUIT

Paper : EC 403

Full Marks : 100

Time : Three hours

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

Answer **any five** questions out of **seven**.

1. (a) Describe the operation of a Phase-Locked Loop (PLL) using its block diagram. Mention its different operating modes. 8+2

(b) Draw the circuit diagram for an integrator whose DC gain is finite and hence derive the expressions for  $-3dB$  frequency and unity gain frequency. 2+4+4

Contd.

2. (a) Draw the internal block diagram of 555 timer IC and explain the working principle. 10  
 (b) Draw the circuit diagram for a precision rectifier and explain its working. 2+8

3. (a) Explain the working of a Sigma-Delta ADC and mention how is it more advantageous to that of other ADC architectures. 8+2

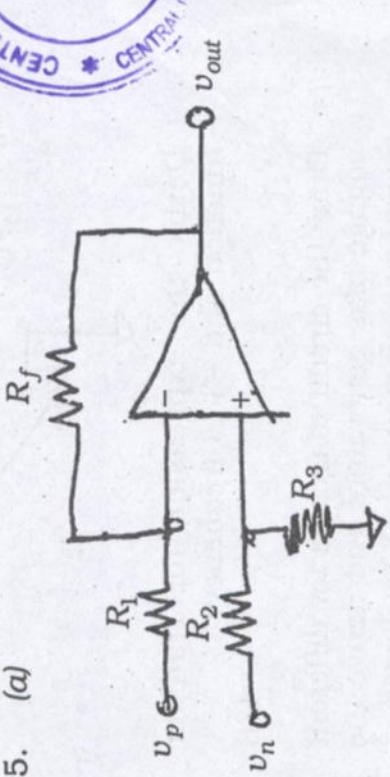
- (b) Design an Active (Butterworth 1st order) Low-pass filter with edge of passband frequency 10kHz and DC gain of 60dB. 5

- (c) Describe the astable operation using 555 timer. Hence derive its time period. 8+2

- (d) Draw the circuit diagrams of different types of level shifters and write the output DC voltage levels. 5

4. (a) Derive the expressions for differential voltage gain for a dual-input unbalanced output (Active current mirror load). 10  
 (b) Derive the differential and common mode gain for a dual-input balanced-output differential amplifier (BJT). 5+5

5. (a)



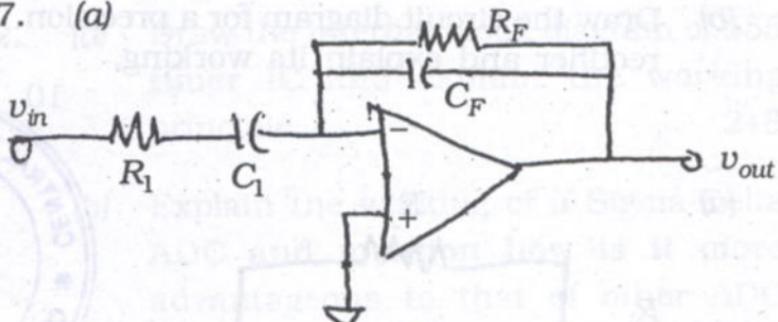
Derive the expression for differential gain and common mode gain. 5+5

- (b) Describe the monostable operation of a 555 timer and derive the time period of its output. 8+2

6. (a) Describe the log and anti-log operation using op-Amp. 5+5  
 (b) Derive the differential and common mode gain for a dual-input balanced-output differential amplifier (BJT). 5+5



7. (a)



Derive the expression for transfer function and  $-3dB$  frequency.

4+6

- (b) Draw the circuit diagrams for different voltage bias generators and derive the expressions for output DC voltages.

10

Instructions for marking and evaluation

1. All answers should be handwritten.

2. Diagrams should be clearly drawn.

3. Numerical values should be clearly indicated.

4. All calculations should be shown.

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12. All calculations should be shown.

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18. Diagrams should be clearly drawn.

19. Numerical values should be clearly indicated.

20. All calculations should be shown.