Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (R,S), DECEMBER 2023
ELECTRONICS AND COMMUNICATION ENGINEERING

(2020 SCHEME)

Course Code : 20ECT301

Course Name: Linear Integrated Circuits

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Draw the equivalent circuit and the voltage transfer curve of the operational amplifier.
2. List out any three ideal characteristics of an op-amp.
3. Design an op-amp circuit to obtain an output voltage, $V_0 = -(2V_1+2V_2+4V_3)$.
4. Explain the working of an inverting comparator with neat diagrams.
5. Explain the working of a notch filter.
6. Draw the circuit of monostable multivibrator using op-amp.
7. Draw the functional diagram of timer IC 555.
8. Define lock range and capture range in PLL.
9. Explain current boosting in IC 723.
10. Define resolution and linearity in the case of DAC and ADC.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Describe the principle of operation of Wilson current mirror. Derive the expression for its current gain. (6)

    b) Explain the following properties of a practical op-amp (i) input bias current (ii) Slew rate (iii) Input offset voltage (iv) Input offset current. (8)

OR

12. a) Sketch and explain the necessity of each block of an op-amp. Draw the pin out of IC741. (8)

b) Derive the expression for differential mode gain and common mode gain of BJT differential amplifier. (6)

MODULE II

13. a) Describe the working of a voltage to current converter. (4)
b) With neat diagram, explain the working of a differentiator with frequency response. List out the disadvantages. (10)

OR

14. a) Explain the working of an inverting Schmitt trigger circuit using op-amp. Draw its output waveform with V_{ref} = 0V. (10)
b) Design an op-amp circuit to get the output voltage of $V_0=V_1-V_2$. (4)

MODULE III

15. a) With a neat circuit diagram explain the working of an astable multivibrator using op-amp. Also derive an expression for time period. (8)
b) Derive the equation for the transfer function of a first order low pass filter. (6)

OR

16. a) Derive the frequency of oscillation of an RC phase shift oscillator using op-amp. (8)
b) Design a second order Butterworth HPF with cut off frequency of 1 KHz and pass band gain of 2. (6)

MODULE IV

17. a) Explain AM detection using PLL. (4)
b) With the help of internal diagram, explain the monostable operation of timer IC 555. Draw the input and output waveforms. Derive the equation for pulse width. (10)

OR

18. a) With the help of internal diagram, explain the astable operation of timer IC 555. Draw the input and output waveforms. (9)
b) Design a monostable multivibrator using 555 timer for a pulse width of 1ms. (5)

MODULE V

19. a) Explain the working of a low voltage regulator IC723 with diagram. (5)

b) Sketch and explain the operation of a 3-bit flash type converter. (9)

OR

20. a) Derive the output voltage for a 3 bit R-2R ladder D/A converter. (7)
b) Explain the working of a successive approximation type ADC with diagram. (7)

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