Reg. No. : | E | N | G | G | T | R | E | E | . | C | O | M |

Question Paper Code : 20978

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Fourth Semester

Electrical and Electronics Engineering

EE 3402 – LINEAR INTEGRATED CIRCUITS

(Regulations 2021)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a monolithic IC?

2. What is a PV cell?

3. An Op-Amp has a slew rate of $2V/\mu s$. What is the maximum frequency of an output sinusoid of peak value %V at which distortion sets in due to slew rate limitation? Also calculate the exact closed loop gain of the inverting amplifier if $A_{OL} = 20000$, $R_i = 2M\Omega$ and $R_s = 75\Omega$.

4. Draw the circuit of an Integrator.

5. What is an analog multiplier?

6. Calculate the values of LSB, MSB and full scale output Voltage for a 4-bit DAC for the 0 to 5V range.

7. A square wave generator circuit designed using 555 Timer has $V_{cc} = 12V$, $R_1 = 10K\Omega$ and $C_1 = 0.1\mu F$. Determine the circuit output frequency.

8. What is a Voltage Controlled Oscillator?

9. What are the applications of an instrumentation amplifier?

10. What is the purpose of having input and output capacitors in three terminal IC regulators?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the classifications of ICs. (6)

(ii) Explain the following processes in detail : Epitaxy, Masking and Etching. (7)

Or

(b) (i) Explain the IC packaging techniques. (8)

(ii) Explain the steps used in fabrication of diodes. (5)

12. (a) (i) Explain the methods used to avoid unstable condition in op-amp. (5)

(ii) Draw and explain the AC characteristics of op-amp. (8)

Or

(b) Explain the following applications of OPAMP:

(i) Voltage to Current Converter (6)

(ii) Current to Voltage Converter (7)

13. (a) Explain the following applications of OPAMP:

(i) Clippers

(ii) Clampers

(iii) S/H circuit

Or

(b) With aid of neat diagram briefly explain.

(i) Weighted resistor DAC

(ii) R-2R ladder

14. (a) With neat diagram explain the operation of astable and monostable multivibrators. Design a 555 astable multivibrator to give 2 KHz pulse repetition frequency with 70% duty cycle. Use Vcc = 18V.

Or

(b) Explain the basic blocks of PLL and its operation. A PLL system with 105 KHz input has a VCO with 100 KHz free running frequency and 3.3 kHz/V sensitivity and phase detector sensitivity is 0.68 V/rad, and amplifier gain is 5. Calculate the loop gain, capture range, maximum error voltage and maximum amplitude of the output voltage of the system.

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15. (a) With neat diagram explain IC723 general purpose voltage regulator. Explain the current limiting features of 723.

Or

(b) Explain the working principle of switch-mode power supplies along with its advantages and disadvantages.

PART C — (1 × 15 = 15 marks)

16. (a) Design an Opamp based circuit to implement the following equation $I = I_0 \left[e^{qV/KT} - 1 \right]$ where V is the input and assume the values of I_0, K, T as constants.

Or

(b) Find the resolution and input voltage required to change by 1 LSB for an 8-bit A/D converter. Assume the input voltage range is 0 to 10V. Describe the operation of dual slope A/D converter.

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