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Question Paper Code : 70558

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

Fourth Semester

Electrical and Electronics Engineering

EE 8451 — LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

(Common to : Electronics and Instrumentation Engineering/
Instrumentation and Control Engineering)

(Regulations 2017)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   Mention the various advantages of Integrated Circuits over Discrete Circuits.

2.   List the steps involved in the preparation of silicon wafer.

3.   Define the term, "Thermal Drift".

4.   Draw the circuit diagram of a Subtractor using an OP-AMP.

5.   How does a Zero-Crossing Detector generate Square Waveform?

6.   Compute the output voltage of a 4-bit DAC whose output range is 0 to 10 V, if the input is 0110.

7.   Why is VCO otherwise known as Voltage to Frequency Converter?

8.   Write down the applications of 555 Timer in Monostable Mode.

9.   How do Switching Regulators have better efficiency than Series Regulators?

10.   List the characteristics of an Optocoupler.

PART B — (5 × 13 = 65 marks)

11. (a) With neat diagrams, explain the p-n junction isolation and Dielectric isolation techniques.

Or

(b) Elucidate the classification of Integrated Circuits (IC).

12. (a) With neat circuit diagrams, explain the operation of Inverting and Non-inverting Summing amplifiers using OP-AMP.

Or

(b) Design a circuit using OP-AMP that will differentiate input signal with f_{max} = 100 Hz. Draw the output waveforms for a sine wave and a square wave of 1 V peak-to-peak at 100 Hz applied to the circuit.

13. (a) Explain the functioning of an Instrumentation Amplifier with a neat circuit diagram.

Or

(b) Illustrate the construction and working of R-2R ladder type Digital to Analog Converter (DAC).

14. (a) With neat block diagrams, explain how the Phase Locked Loop is used as AM Demodulator, FM Demodulator and FSK Demodulator.

Or

(b) Draw the circuit of a Schmitt Trigger using 555 Timer and explain the operation.

15. (a) Explain the operation of ICL8038 Function Generator IC with necessary diagrams.

Or

(b) Discuss in detail about Current Limiting and Current Foldback Characteristics of IC723 Regulator.

PART C — (1 × 15 = 15 marks)

16. (a) (i) Explain the operation of RC Phase Shift Oscillator with necessary diagrams and derive the expression for the frequency of oscillations. (10)

(ii) Design a RC Phase Shift Oscillator to oscillate at 100 Hz. Assume $C = 0.1 \ \mu F$ and $R_f = 29R_1$. (5)

Or

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(b) (i) With a neat block diagram of Phase Locked Loop (IC 565 PLL), derive the expression for Lock-in Range and Capture Range of PLL.

(10)

(ii) Compute the free running frequency f_0, Lock-in Range, and Capture Range of PLL 565. Assume $R_T = 20 \text{ k}\Omega$, $C_T = 0.01 \ \mu\text{F}$, $C = 1 \ \mu\text{F}$, and supply voltage is $+/- 6\text{V}$.

(5)