

R13

Code No: 115EB

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year I Semester Examinations, March - 2024

LINEAR AND DIGITAL IC APPLICATIONS

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

- 1.a) What is an ideal active integrator? [2]
- b) Compare the ideal and practical Op-Amp characteristics. [3]
- c) Explain the significance of the input impedance of an op-amp in various circuit applications. [2]
- d) List out the features of 555 IC. [3]
- e) What is meant by the linearity of a DAC? Why is it important? [2]
- f) Explain how does an R-2R ladder DAC achieve its binary-weighted output? [3]
- g) Explain the function of a magnitude comparator. [2]
- h) Explain the operation and applications of code converters in digital systems. [3]
- i) Explain the difference between edge-triggered and level-triggered flip-flops. [2]
- j) Name the different types of ROMs and discuss their specific applications. [3]

PART – B

(50 Marks)

- 2.a) Design a non-inverting amplifier with a gain of 5 using a 741 op-amp. Specify the values of the resistors and the power supply voltages. Assume that the input voltage range is from 0 to 3 V.
- b) Explain the principle and operation of a voltage regulator and describe the features of 723 regulator. [4+6]

OR

- 3.a) Calculate the output voltage of an inverting amplifier with a gain of -10, if the input voltage is 2 V. Assume that the op-amp is ideal and has a single power supply of 15 V.
- b) Design an instrumentation amplifier using three Op-Amps and derive its gain expression. [3+7]
- 4.a) Explain the block schematic and operation of IC565 PLL.
- b) Design a monostable multivibrator using the IC555 timer to generate a pulse width of 100 ms. Calculate the required external components. [5+5]

OR

- 5.a) Design a square wave generator using Op-Amps and explain their working.
b) A triangular wave of 5 V peak-to-peak and 50 kHz frequency is applied to the input of a PLL using IC-565. The free-running frequency of the VCO is 40 kHz. Find the lock time of the PLL, and sketch the waveforms of the input signal, the VCO output and the phase detector output. [5+5]

- 6.a) Explain a weighted resistor DAC.
b) Design a 4-bit R-2R ladder DAC with $V_{ref} = 5V$. Calculate the output voltage for the input 0011. [7+3]

OR

- 7.a) Explain a parallel comparator ADC.
b) Design a 3-bit parallel comparator ADC with $V_{ref} = 10V$. Draw the conversion transfer function and the quantization error function. [6+4]

- 8.a) Explain the specifications and applications of TTL-74XX series ICs and design a code converter using them.
b) Design a 4-to-16 decoder using two 3-to-8 decoders and one 2-to-4 decoder. Show the circuit diagram, truth table, and explain the operation. [5+5]

OR

- 9.a) Explain the concept and operation of LCD decoders with drivers and design a seven segment display using it.
b) Design a 4-bit parallel binary adder/subtractor using 7483 IC. Show the circuit diagram, truth table, and explain the operation. [5+5]

- 10.a) Explain the working principle of a JK flip-flop and its applications in digital circuits.
b) Calculate the maximum clock frequency that can be applied to a decade counter built using 74XX series ICs to ensure reliable operation. [5+5]

OR

- 11.a) Design a 3-bit synchronous up-counter using 7476 JK flip-flops.
b) Discuss the architecture and operation of a 4x4 ROM using the CMOS 40XX series ICs. [5+5]

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