

LOGIC SYSTEMS N431

(One 3-hour paper)

(With effect from January 1984)

1. Introduction : Analogue and digital representation; characteristics of an electronic digital computer; structure of an electronic digital computer; brief history of the digital computer.
2. Number systems and codes: The decimal, binary, octal and hexadecimal number systems. Radix conversions. Arithmetic operations in the binary number system : addition, subtraction, multiplication and division. Number Representation for the computer : signed magnitude and complement representation.  
  
Binary codes : Weighted, self-complementing, reflected, error-detecting and correcting codes. Alphanumeric codes: ASCII, ABCDIC.
3. Boolean algebra and logic gates : Boolean algebra: logic Functions and De Morgan's theorems. Simplifying logic circuits: fundamental products; sum of products; products of sums; algebraic simplification; Karnaugh map simplification.  
  
The Electronic switch: The diode switch; the transistor switch; TTL; MOS Logic; ECL; LSI, MSI and SSI; I.C..  
  
Decoder and encoder design: Selector gates; matrix decoder; code converters.
4. Multivibrators: The astable multivibrator: transistor type; logic type. The monostable multivibrator: Transistor type; logic type (RS, gated RS, master-slave and D-type flip-flops). The Scmitt trigger. Waveshaping and generation with multivibrators.

LOGIC SYSTEMS N521

(One 3-hour paper)

1. Sequential logic

Asynchronous counters: Binary, up-down and decade counters. Counter design.

Synchronous counters: Binary, up-down and decade counters. Counter design.

Shift registers: Serial and parallel entry. Shift right-left, universal shift and circulating register.

Ring counters: Basic ring and automatic ring counter.

Counter implementation and applications: Multiplexers and demultiplexers; counting measurements; frequency dividers; digital clocks.

2. Arithmetic units

Parallel binary arithmetic unit: Addition and subtraction; multiplication; look ahead carry; division.

Serial binary arithmetic unit: Addition and subtraction; multiplication, division.

BCD Arithmetic units: The 8421-adder, excess-3 adder; multiplication, division.

Floating point parallel arithmetic unit: Addition; subtraction.

3. Memories

Memory hierarchy and characteristics.

Magnetic core memory: Construction; selection technique; organization and wiring schemes.

Semiconductor memories: Bipolar, MOS and bubble memories.

Magnetic memories: Drum, disk and tape.

4. Input and output units

Characteristics and working principles of: Punched cards; punched tapes; teleprinter; CRT displays; optical character reader.

LOGIC SYSTEMS N631

(One 3-hour paper)

1. Digital instruments and systems

Data domains and interconversions: Domains; interdomain converters.

Operational amplifier: The ideal and IC operational amplifiers. Linear and non-linear operations.

Digital to analogue converter: Weighted - register, ladder register, serial D-A converter.

Analogue to digital converter: Continuous balance; staircase-ramp; successive approximation; voltage-to-time-to-digital; dual slope integrator; voltage to frequency.

Construction and operation of a digital multimeter using LSI.

2. The stored programme electronic digital computer

Complete layout of a computer system: CPU; busses; peripherals.

Architecture of a CPU: Accumulator; program counter; instruction register; address register; control circuitry.

Computer operations: Timing; instruction fetch; memory read/write; memory synchronization; input/output; interrupts; hold.

Programming: Instruction procedure; branch and jump; subroutines; priority interrupt; DMA.

Interfacing: ROM, RAM, I/O, teleprinter and CRT