DIGITAL CONTROL SYSTEMS

UNIT – I:
Introduction to signals
Introduction of continuous and discrete time signals, shifting and scaling operator, periodic and nonperiodic signals, linear time invariant and causal systems

UNIT-II:
Introduction to z-transforms
Z-Transform and theorems, finding inverse and method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

UNIT-III:
Sampling and reconstruction
Introduction, sampling theorem, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

UNIT – IV:
State space analysis
State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations

UNIT – V:
Controllability and observability
Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function

UNIT – VI:
Stability analysis
Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – VII:
Design of discrete time control system by conventional methods
Transient and steady – State response Analysis – Design based on the frequency response method –Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

UNIT – VIII:
State feedback controllers and observers
Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula.