



SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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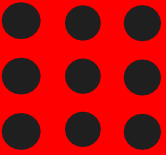
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : 19EE407 ELECTRICAL MACHINES AND DRIVES

I YEAR /IV SEMESTER MECH

Unit 1 – OVERVIEW OF ELECTRICAL DRIVE

TOPIC: CLASSES OF MOTOR DUTY





Classes of Motor Duty

- ✓ Motor Duty = amount of time the motor is operating under full load, and how much time it is stopped
- ✓ Continuous Duty: constant full load for over 60 minutes at a time
- ✓ Intermittent Duty: fully loaded for 5, 15, 30, or 60 minutes





Types of Duties

S1: Continuous Duty

S2: Short Time Duty

S3: Intermittent Periodic Duty

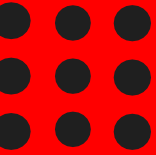
S4: Intermittent Periodic Duty with Starting

S5: Intermittent Periodic Duty with Starting and Braking

S6: Continuous Duty with Intermittent Periodic Loading

S7: Continuous Duty with Starting and Braking

S8: Continuous Duty with Periodic Speed Changes

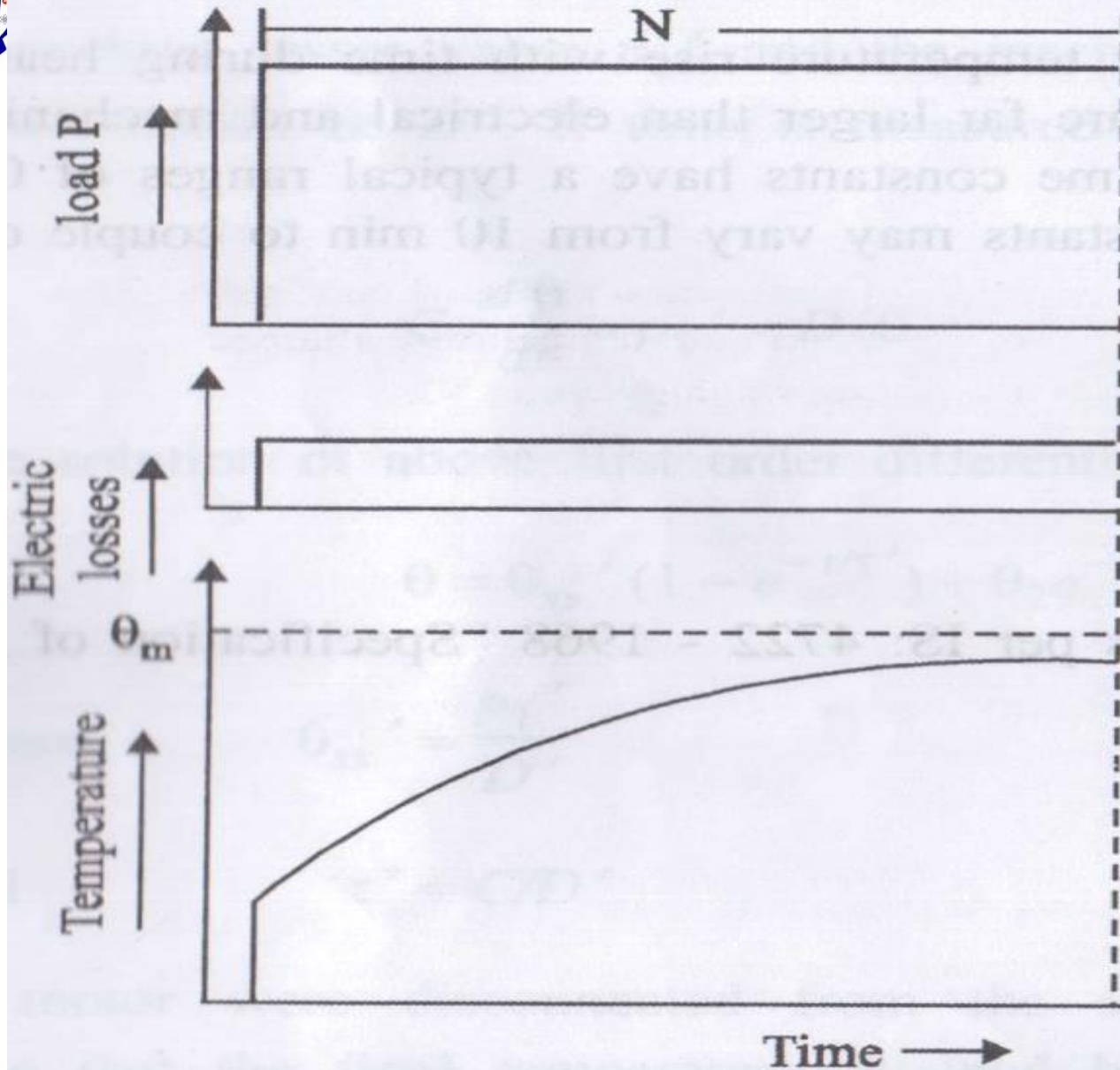




S1: Continuous Duty

- ✓ Constant Load Torque for long duration, it's enough for motor temperature to reach steady state value.
- ✓ Constant motor losses
- ✓ E.g: Paper Drives, Compressor, Conveyer, Fans Etc.





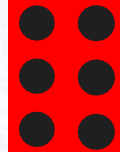
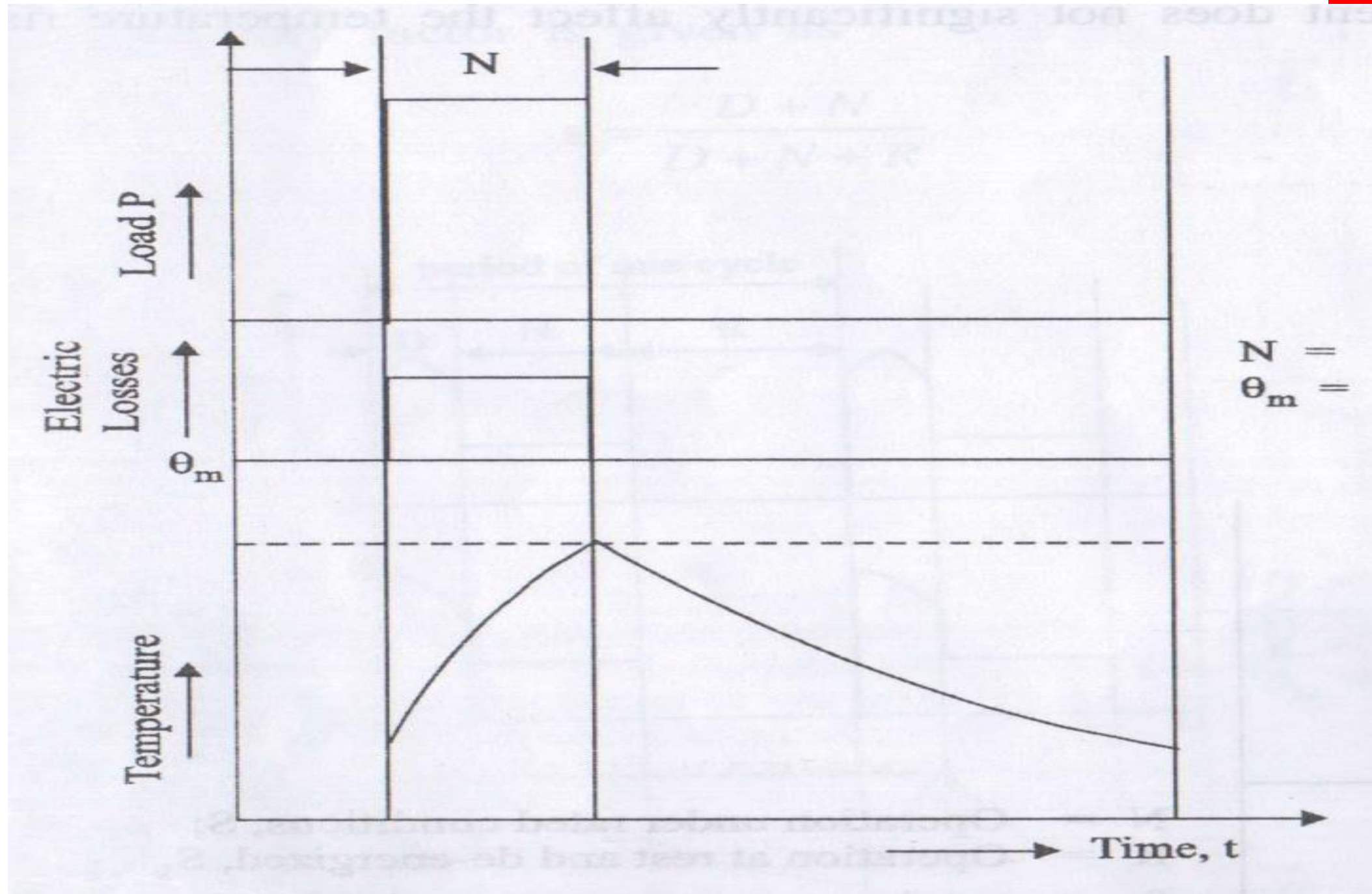
N = Operation under related conditions, S;
 θ_m = maximum temperature °C



S2: Short Time Duty

- ✓ Operated for a short period, less than heating time constant of the motor
- ✓ Load period is so short so that machine cant reach it's thermal equilibrium
- ✓ Rest is so long so motor temp drops to ambient temp
- ✓ E.g: Crane drives, Railway turntable

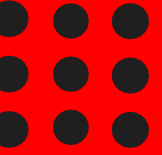






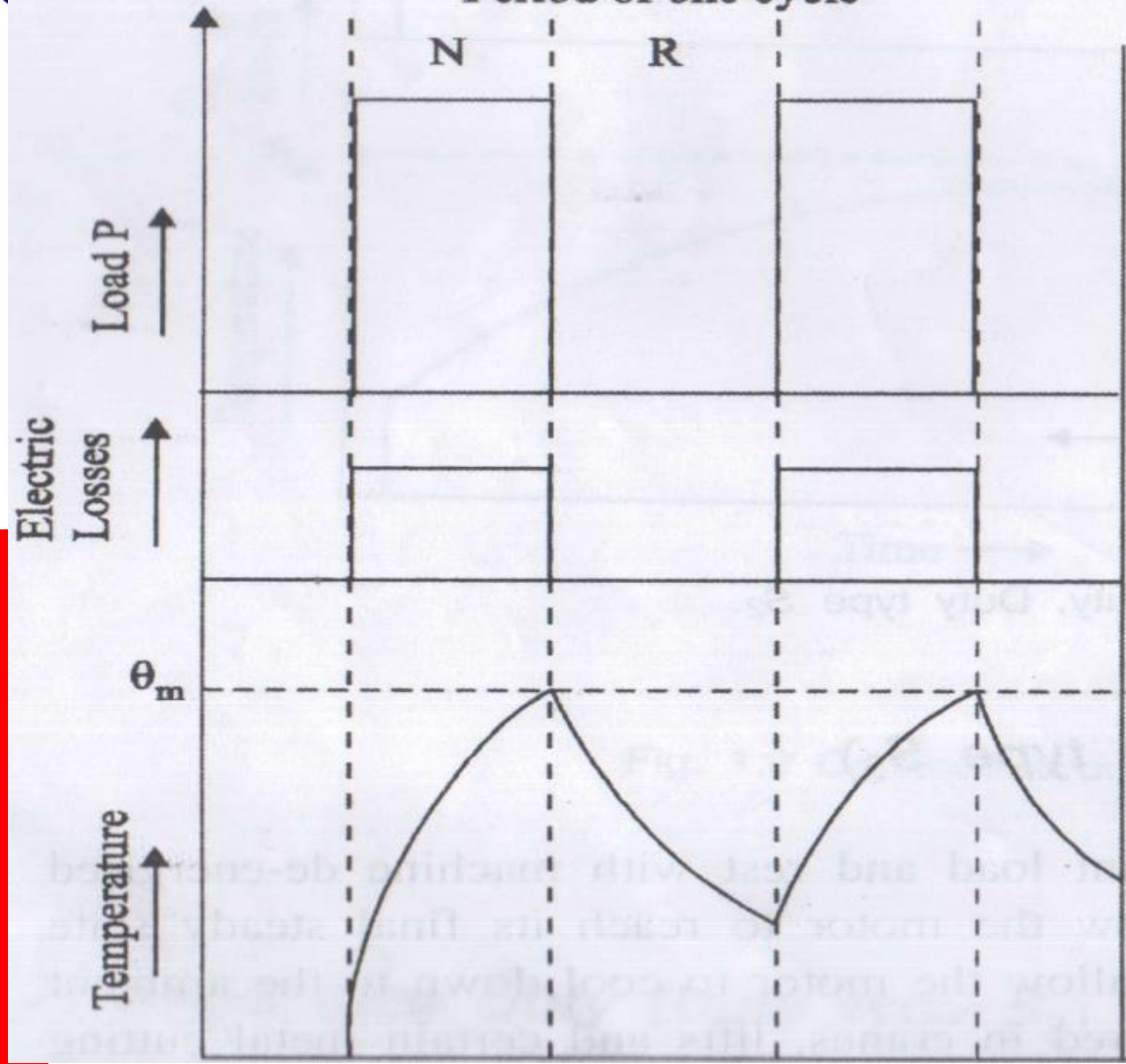
S3: Intermittent Periodic Duty

- ✓ Period of running at constant load & rest period.
- ✓ Load period is too short to reach final temp
- ✓ Rest period is too small to allow ambient temp
- ✓ E.g: Cranes, lifts
- ✓ Duty Factor = $N/(N+R)$





Period of one cycle



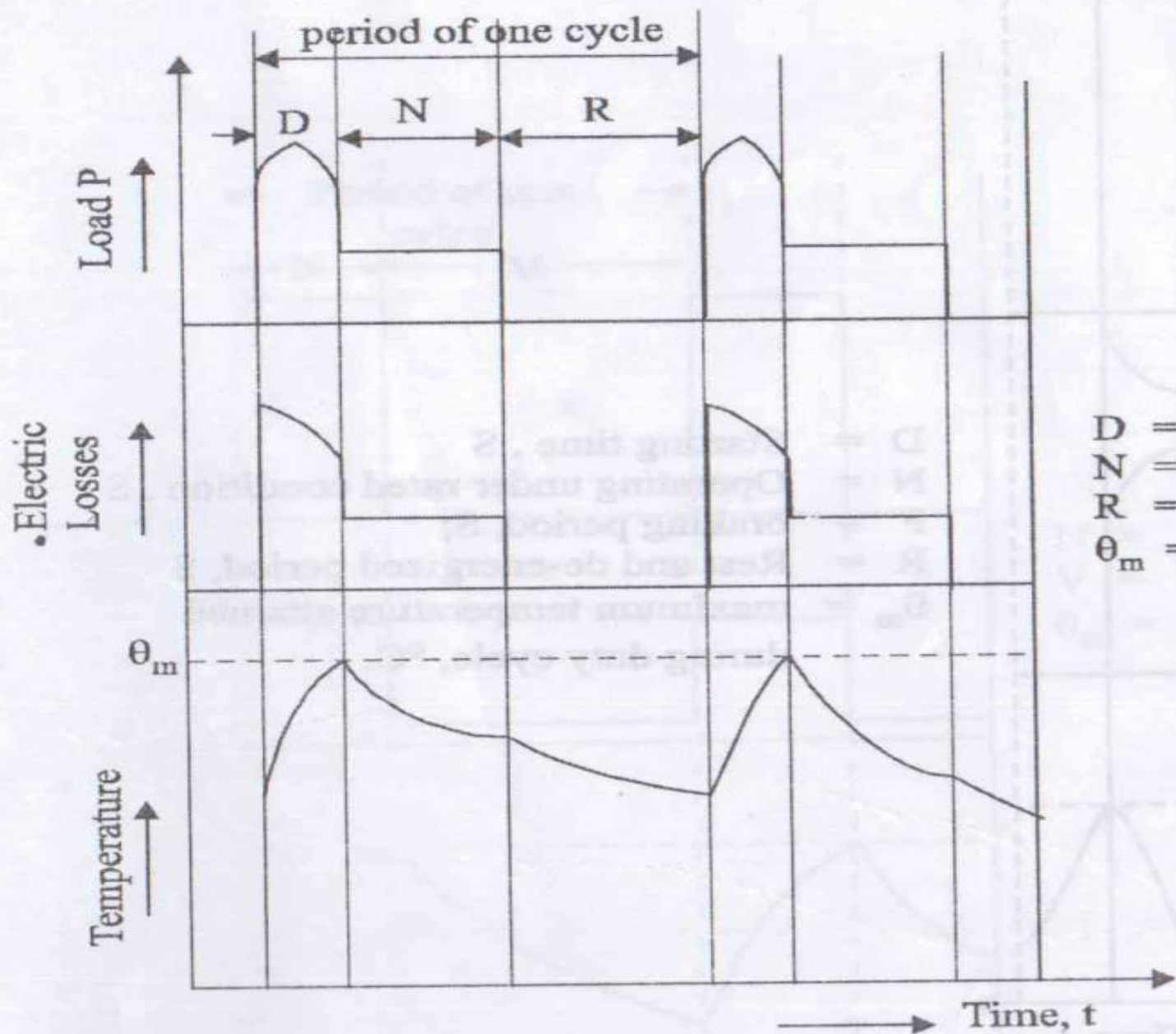
- N** = Operation under rated conditions, S_1
- R** = Operation at rest and de-energized, S_0
- θ_m = maximum temperature attained during duty cycle, °C.



S4: Intermittent Periodic Duty with Starting

- ✓ Period of starting, operation at constant load and rest.
- ✓ Heat losses during starting is cant be ignored
- ✓ Operating and rest periods are too short
- ✓ Duty factor = $(D+N)/(D+N+R)$
- ✓ E.g: metal cutting and drilling tool drives





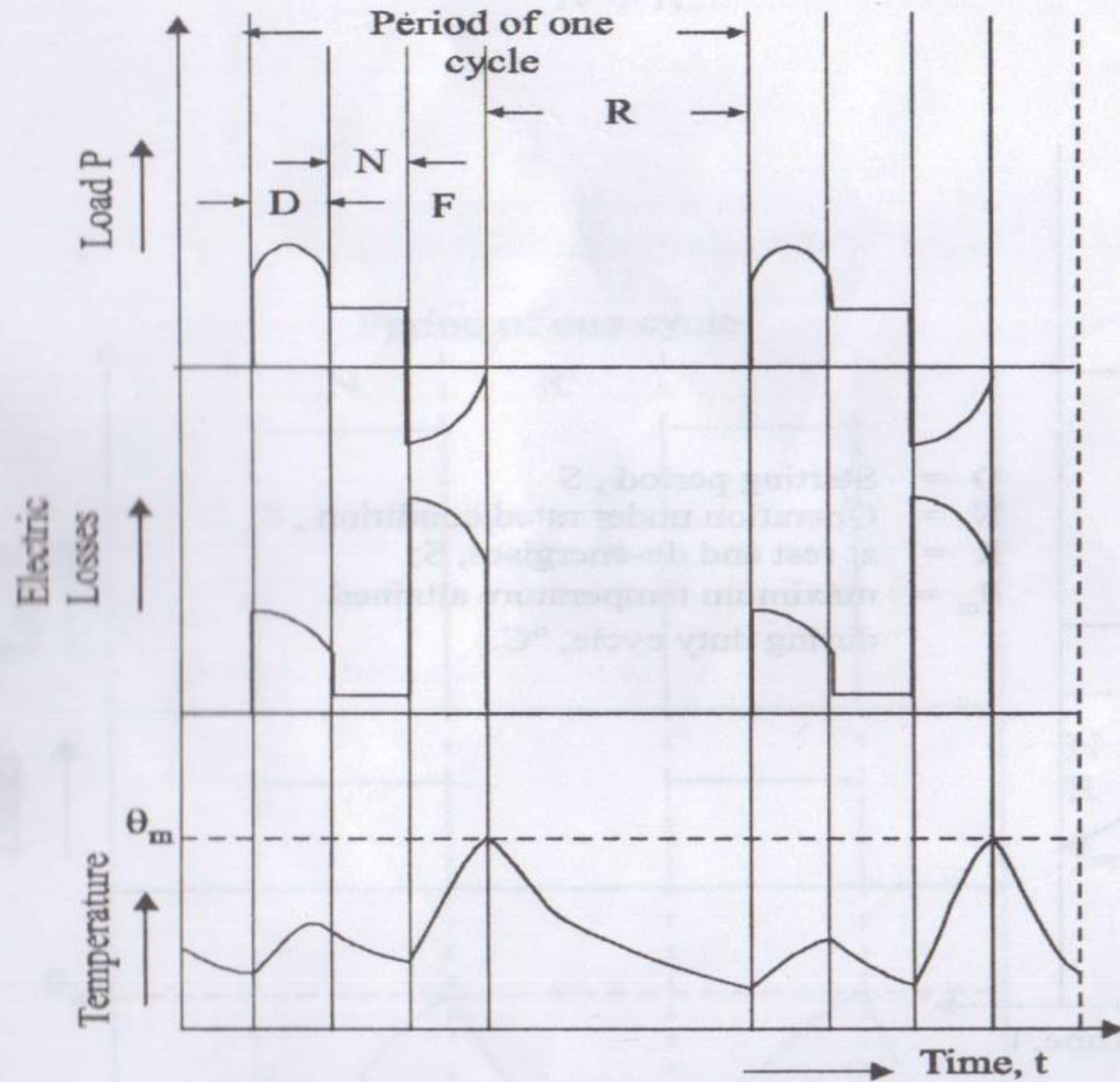
- D = Starting period, S
- N = Operation under rated condition, S
- R = at rest and de-energises, S;
- θ_m = maximum temperature attained during duty cycle, °C.



S5: Intermittent Periodic Duty with Starting and Braking

- ✓ Period of starting, operation at constant load, braking and rest.
- ✓ Operation and rest periods are too short
- ✓ Braking is done by electrical
- ✓ Duty factor = $(D+N+F)/(D+N+F+R)$
- ✓ E.g: billet mill drives, mine hoist





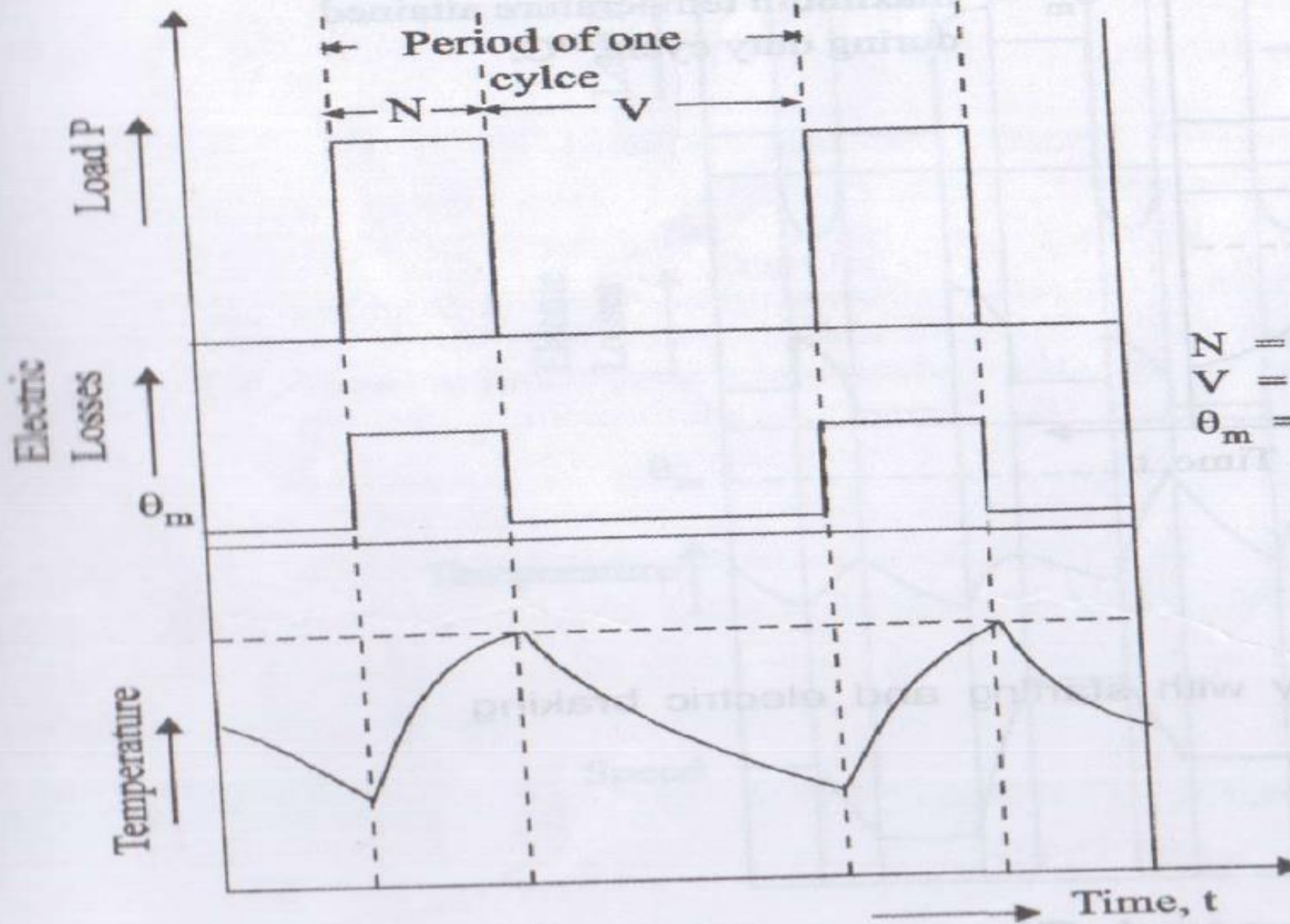
- D = Starting time , S
- N = Operating under rated condition , S
- F = braking period, S;
- R = Rest and de-energized period, S
- θ_m = maximum temperature attained during duty cycle, °C.



S6: Continuous Duty with Intermittent Periodic Loading

- ✓ Period of operation at constant load & period of operation at No load
- ✓ Normal no load voltage at the excitation winding during load period
- ✓ Operation and no load periods are too short
- ✓ Duty factor = $N/(N+V)$
- ✓ E.g: pressing, cutting, drilling machines





N = Operation under rated load
 V = Operation on no load, θ_m = maximum temperature
duty cycle

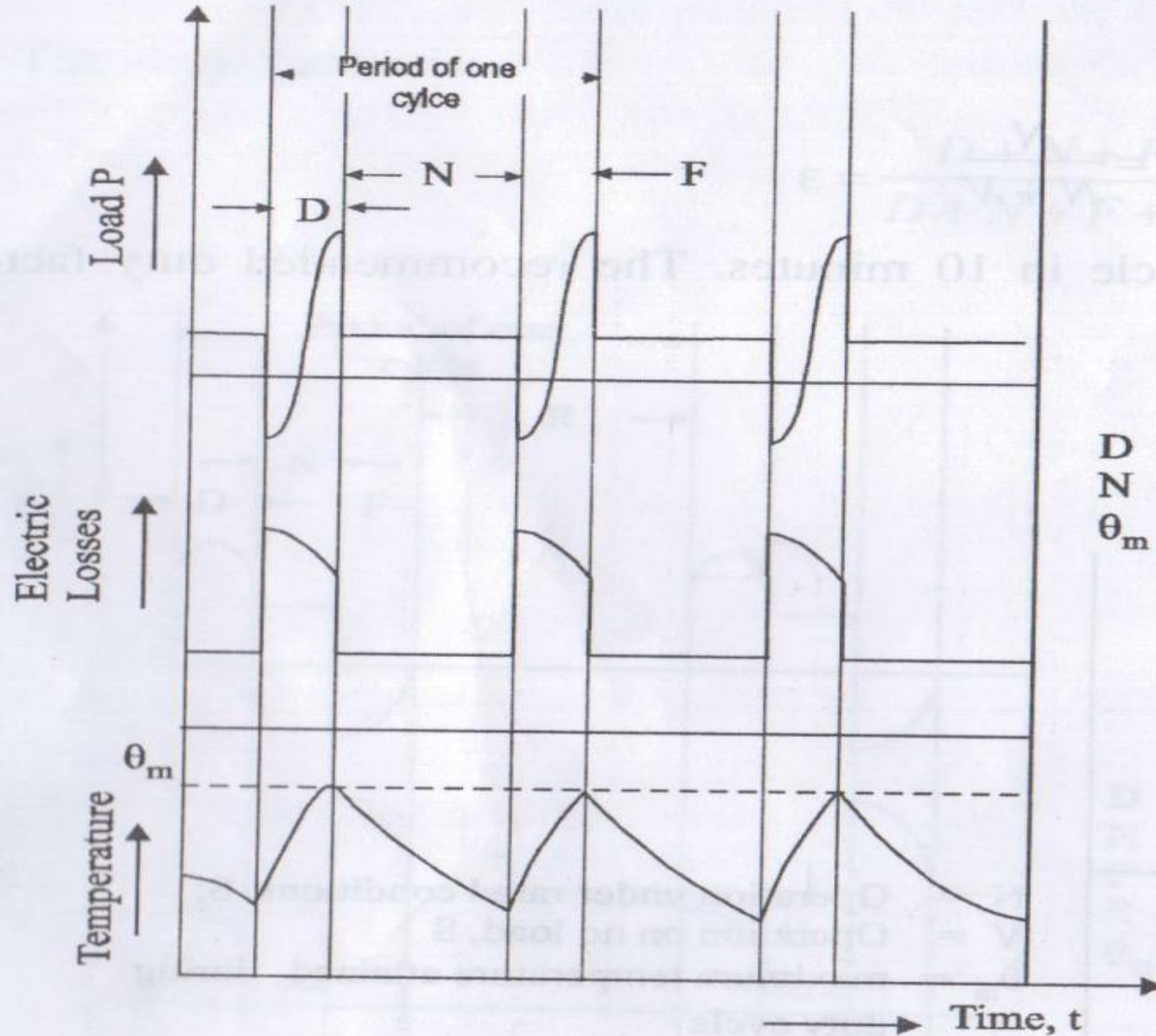
with periodic speed changes (Duty Type 2a)



S7: Continuous Duty with Starting and Braking

- ✓ Period of starting, operation at constant load and braking
- ✓ Braking is by electrical
- ✓ No rest period
- ✓ E.g: Blooming mill drive





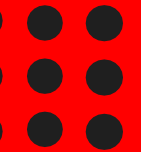
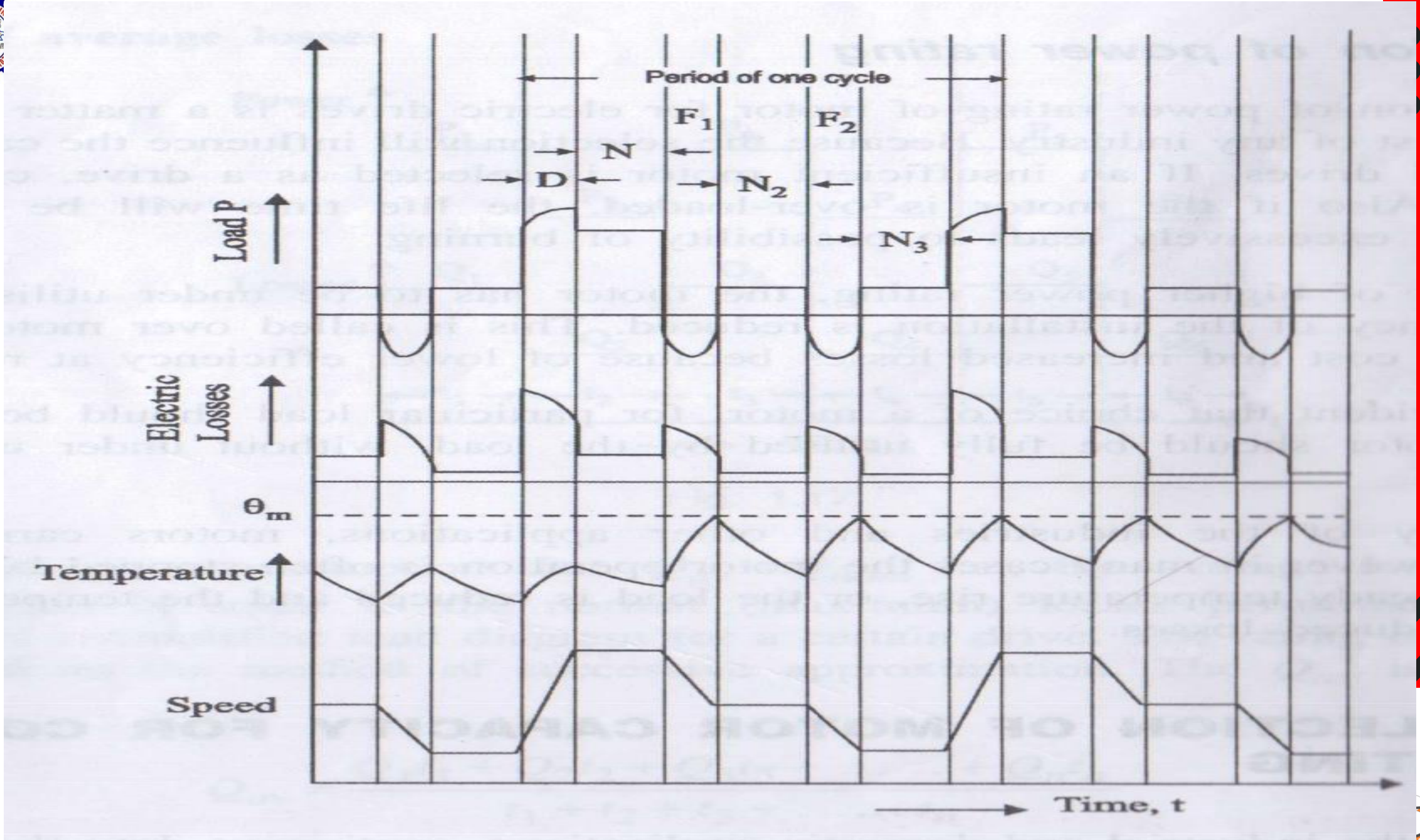
- D = Starting period, S
- N = Operation under rated condition, S
- θ_m = maximum temperature attained during duty cycle, °C.



S8: Continuous Duty with Periodic Speed Changes

- ✓ Period of operation at constant load at determined speed & followed immediately by period of operation at another load corresponding to different speed.
- ✓ Operation period is too short
- ✓ No rest period







References:

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