Classical Control Systems – Final Notes

1. Relay Logic Fundamentals

- Control circuits use Normally Open (NO) and Normally Closed (NC) contacts.
- Self-holding (latching) circuits maintain motor operation after start pushbutton release.
- Auxiliary contacts enable interlocking and feedback control.

2. Motor Starting Methods

- Direct-On-Line (DOL): Full voltage start with high inrush current.
- Forward/Reverse: Phase sequence reversal using dual contactors with interlocking.
- Star–Delta Starter: Reduces starting current using timed transition from star to delta.

3. Interlocking Techniques

- Electrical interlocking via NC auxiliary contacts.
- Mechanical interlocking prevents simultaneous contactor activation.
- Prevents short circuits and motor damage.

4. Timer Applications

- ON-delay timers for star–delta transition.
- OFF-delay timers for delayed shutdown.
- Sequential motor control using time-based logic.

5. Protection Components

- Thermal overload relay for motor protection.
- Circuit breakers and fuses for short-circuit protection.
- Emergency stop integrated in control circuit series path.

6. Industrial Significance

- Foundation for PLC ladder logic programming.
- Essential for troubleshooting industrial panels.
- Builds understanding of real-world control hardware.