ELECTRICAL WIRING

MODULE 4

WIRING SYSTEM SELECTION

- Several factors need to be considered when selecting a system of wiring

- These may include
  - Durability
  - Initial and Maintenance Cost of System
  - Building Construction
  - Hazards (e.g. fire, corrosive fumes)
  - Dampness
  - Nature of Load
  - Aesthetics

SYSTEM TYPES

- Single Phase
  - Most electronics operate on a single phase power source
  - Consists of a two wire system
    - One live and one neutral
- Three Phase
  - Mainly used in distributing power on the grid
  - May consist of 3 or 4 wires
    - 3 wires (all live) in a balance three phase system
    - 4 wires (3 live, 1 neutral) in an unbalanced three phase system
    - The neutral wire in a 3 wire system is earthed

WIRE TYPES

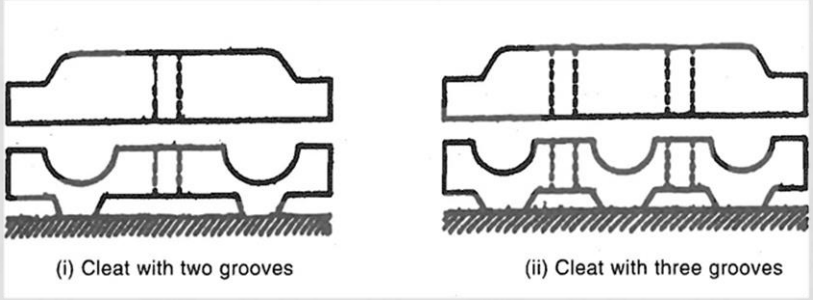
- Vulcanized India rubber (VIR) wire
- Tough Rubber Sheathed (TRS)
- Cab Type Sheathed Wire (CTS)
- Poly Vinyl Chloride wire (PVC)
- Lead Sheathed Wire

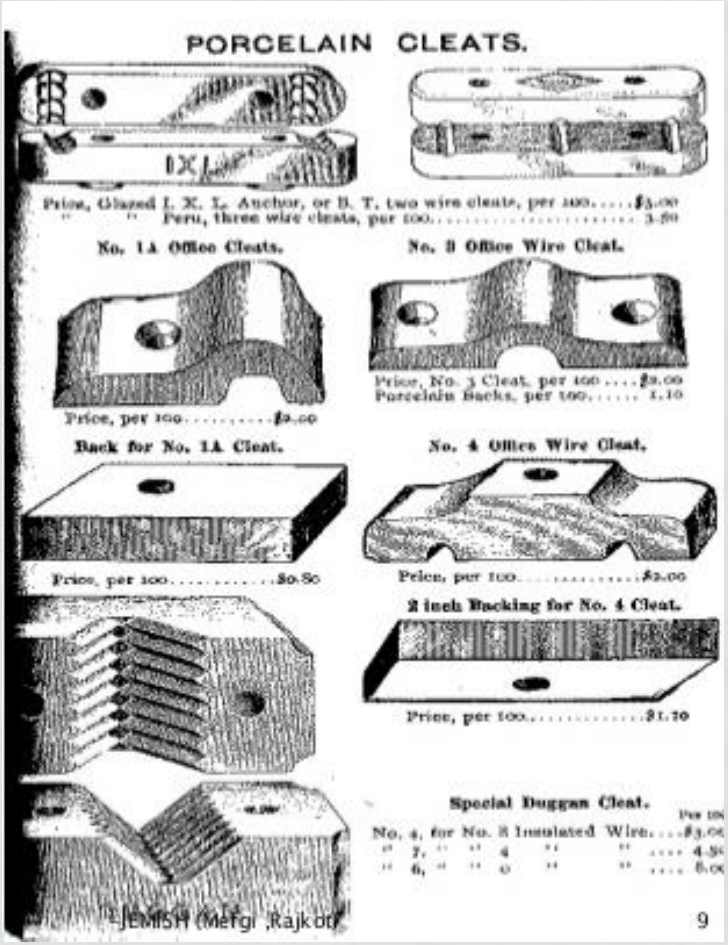
WIRING TYPES

- Common types of wiring in Pakistan
  - Cleat Wiring (VIR/PVC)
  - Wooden Casing and Capping Wiring (VIR/PVC)
  - CTS or TRS Wiring
  - Metal Sheathed or Lead Sheathed Wiring
  - Conduit Wiring (VIR/PVC)

CLEAT WIRING

- Power cables held together by porcelain cleats





CLEAT WIRING

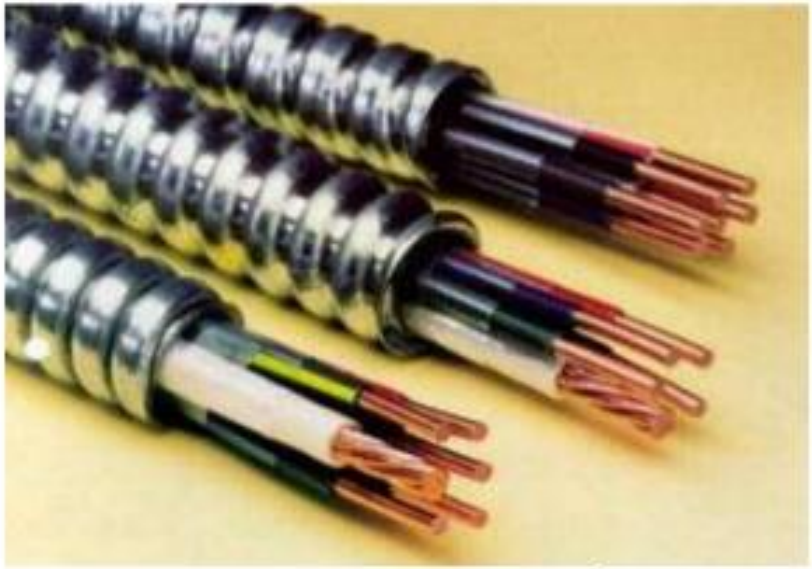
CLEAT WIRING - ANALYSIS

- Advantages
  - Cheap
  - Easy installation
  - Material recoverable
  - Little skill required
  - Easy alteration
- Disadvantages
  - Not aesthetically appealing
  - Temporary
  - Wires exposed to mechanical injury
  - Insulation is easily destroyed in damp environment
- Applications
  - For temporary installation in dry environment
  - Where cost is more important than aesthetics

METAL SHEATHED WIRING

- Used for low voltage installations
- Conductors are insulated with V.I.R. and then covered with an out sheath of lead aluminum allow containing 95% lead and 5% aluminum
- The metal sheath protects the system from mechanical injury, dampness and atmospheric action.
- Run on wooden battens and fixed with the help of tinned link clips

Metal Sheathed Wiring



METAL SHEATHED WIRING - ANALYSIS

Advantages

- Conductors protected against mechanical injury
- Can be used in damp conditions
- Better appearance
- Longer life
- Conductors protected from chemicals

Disadvantages

- More expensive than C.T.S or T.R.S wires
- Expensive installation

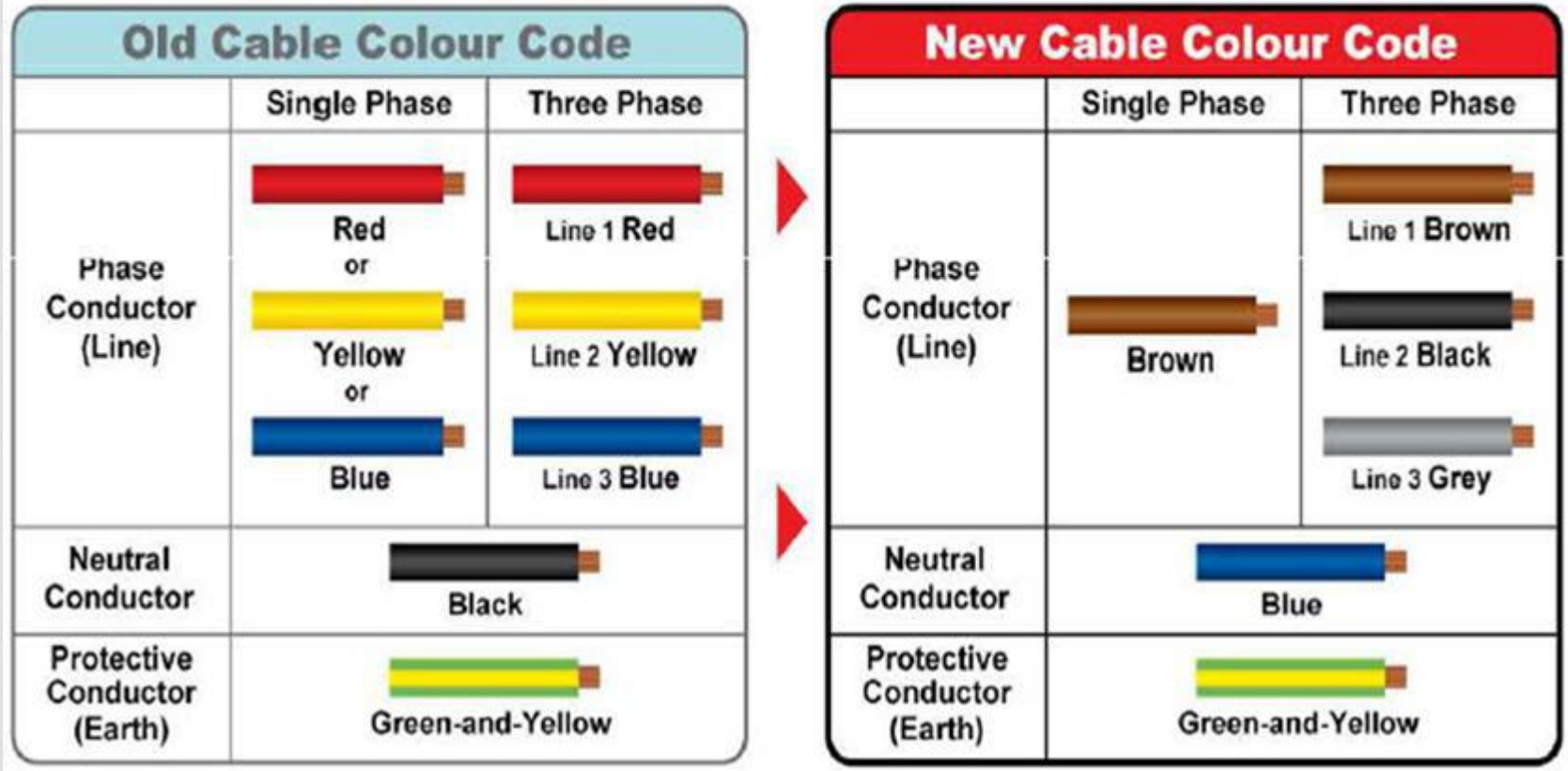
CONDUIT WIRING

- Tubes, known as conduits, are installed on the surface of walls by means of saddles or pipe hooks or buried under plaster and VIR or PVC cables are drawn into afterwards.

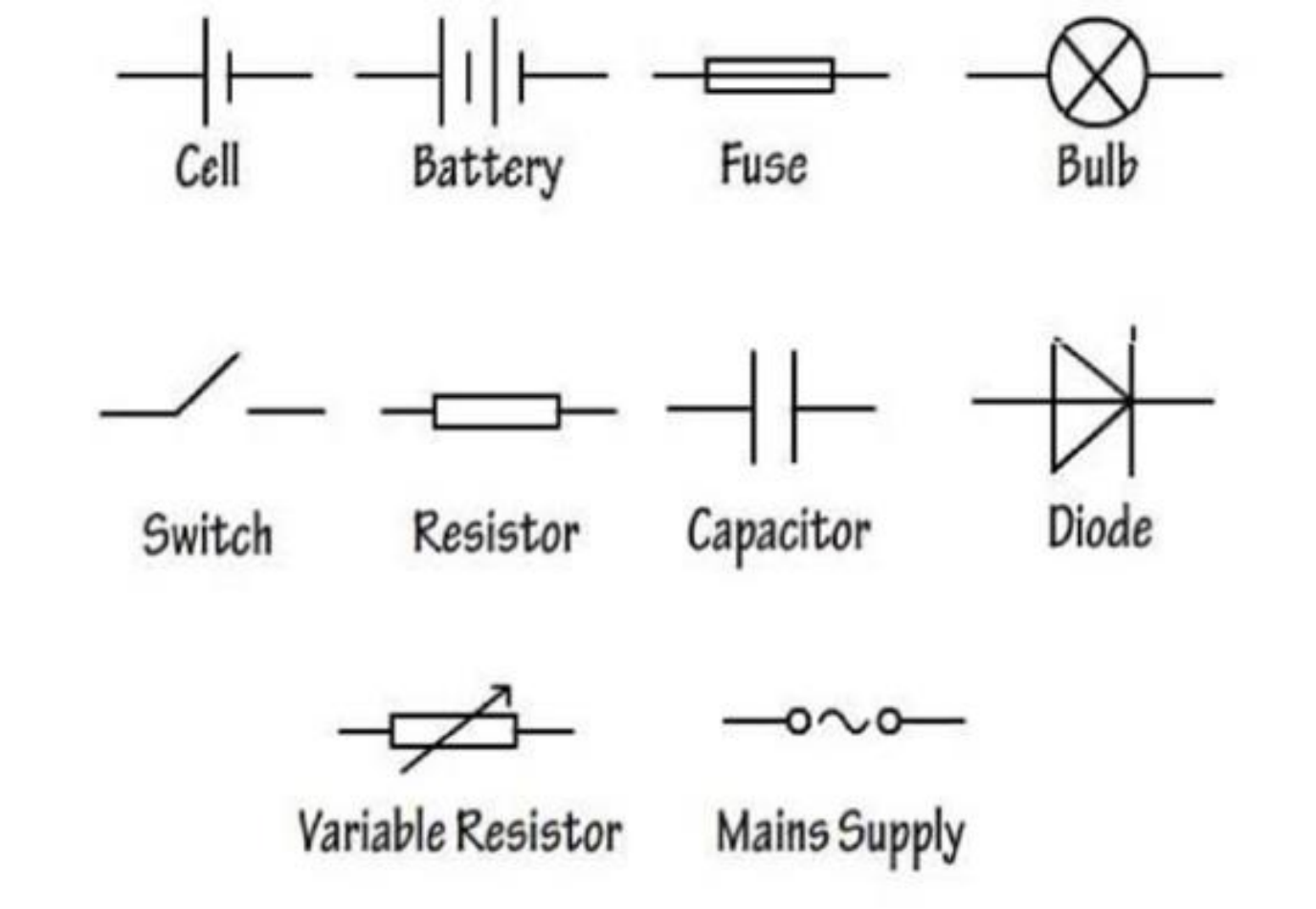
CONDUIT WIRING - ANALYSIS

- Advantages
  - protect against mechanical damage
  - Protect against fire due to short-circuits
  - Water proof
  - Easy alteration
  - Long life
  - Shock proof
- Disadvantages
  - Costly
  - Time consuming
  - Skilled labor required
  - Internal condensation may damage insulation
- Applications
  - Places with dust and puff
  - Damp situations
  - Places with possibility of fire hazard
  - Places where important documents are kept
  - Residential and public building

WIRE COLOR CODES

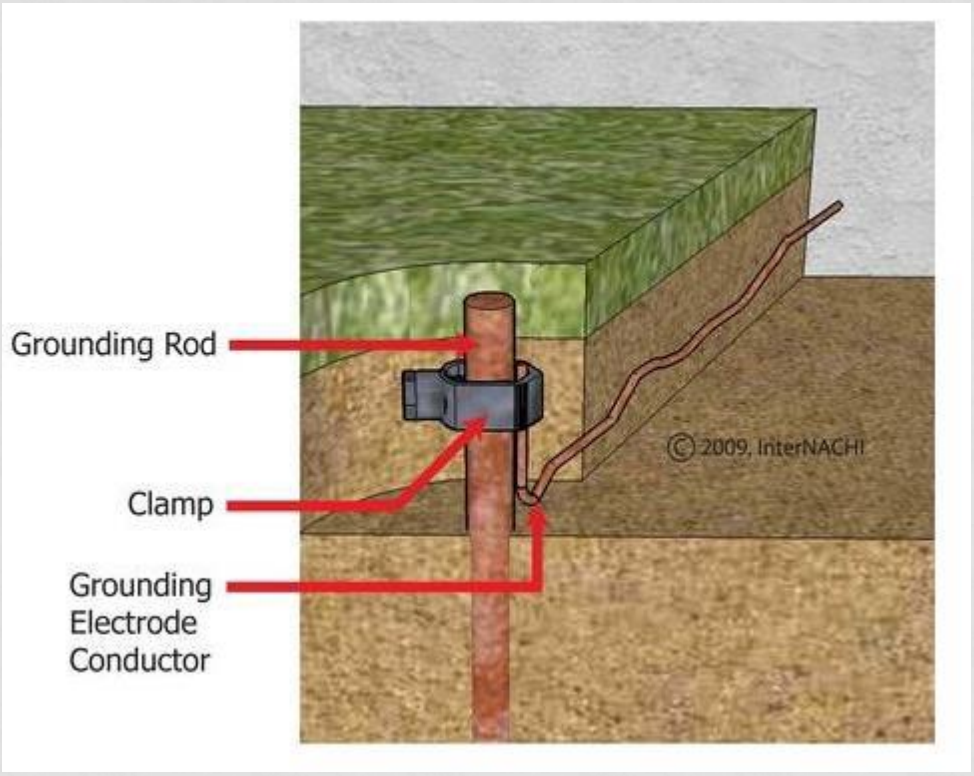


COMMON ELECTRICAL SYMBOLS



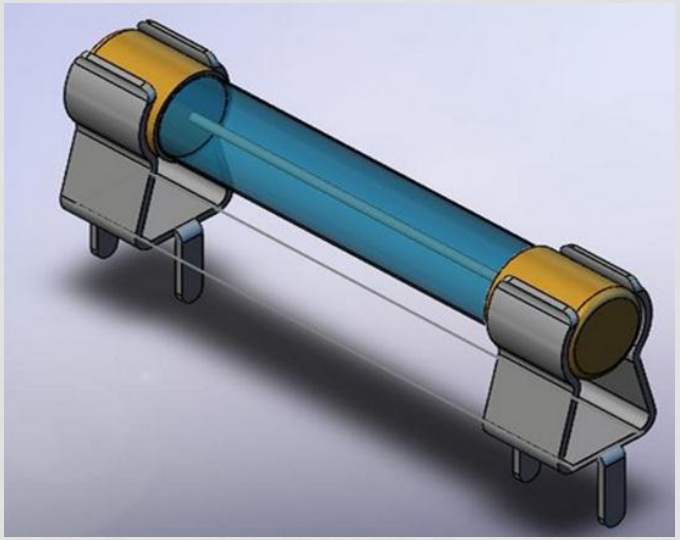
EARTH

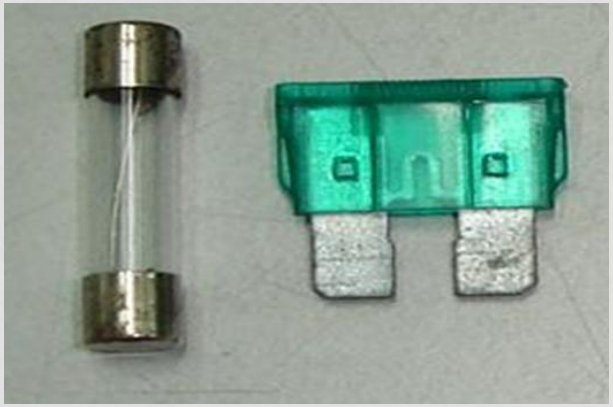
- Earthing is connecting of electrical equipment and wiring systems to the earth by a wire or other conductor
- This is to reduce the risk of serious electric shock from current leakages.
- Lightning and static electricity are the most common sources of dangerous or damaging charges that can be dissipated through a grounding system.
- Grounding electrodes are connected to the building's electrical system through grounding electrode conductors, also known as ground wires (Used as current sinks.)



FUSE

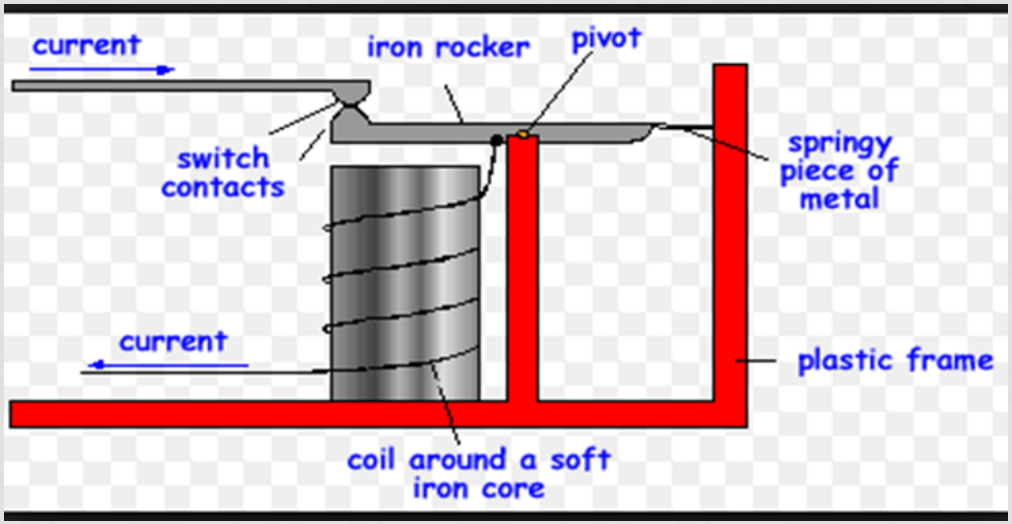
- A fuse is just a thin wire, enclosed in a casing, that plugs into the circuit. When a circuit is closed, all charge flows through the fuse wire -- the fuse experiences the same current as any other point along the circuit.
- The fuse is designed to **disintegrate** when it heats up above a certain level -- if the current climbs too high, it burns up the wire.
- Destroying the fuse opens the circuit before the excess current can damage the building wiring.
- One time useable.





CIRCUIT BREAKER

- Re-useable device for circuit protections
- The electricity magnetizes the electromagnet .
- Increasing current boosts the electromagnet's magnetic force, and decreasing current lowers the magnetism.
- When the current jumps to unsafe levels, the electromagnet is strong enough to pull down a metal lever connected to the switch linkage and shuts off the electricity.



PROJECT 4