Q1 - Attempt any FIVE (10 Marks)

1) Two types of transformer dimmers for illumination control:

Variable autotransformer (Variac) and Electronic dimmer transformer

3) Function of centrifugal switch in single phase induction motor:

Disconnects the starting winding from the supply once the motor reaches 70-80% of synchronous speed, preventing damage to starting winding and improving efficiency.

4) Reason for skewed rotor bars in 3-phase induction motor:

Reduces magnetic noise and vibration by preventing cogging and crawling effects, ensuring smooth operation and better torque characteristics.

5) Slip and synchronous speed:

Slip (s): Difference between synchronous speed and actual rotor speed, expressed as percentage or decimal

Synchronous speed (Ns): Speed of rotating magnetic field = 120f/P rpm (f=frequency, P=poles)

6) Two applications of variable frequency drives:

Speed control in industrial processes (pumps, fans, conveyors)

And Energy saving in HVAC systems and variable torque applications

Q2 - Attempt any THREE (12 Marks)

3) Energy conservation techniques for induction motor:i)
i) Operating in star mode: Reduces voltage per phase by $\sqrt{3}$ times ,Decreases starting current and torque ,Suitable for light load conditions, Saves energy during low load periods

ii) Improving power quality: Use power factor correction capacitors , armonic filters to reduce THD, Maintain balanced supply voltage, Reduces losses and improves efficiency

4) Weekly maintenance of 1-phase induction motor:

(Visual inspection) Check for physical damage, loose connections**(Cleaning)**Remove dust and debris from motor body and ventilation **(Lubrication)**Check bearing lubrication if applicable**(Electrical testing)** Measure insulation resistance, check winding continuity**(Performance check)** Monitor current, voltage, and temperature**(Vibration check)** Ensure smooth operation without excessive vibration

5) Need of energy conservation in transformer:

- (**Reduces losses** (Minimizes core and copper losses (**Cost savings)** Lower operating expenses (**Extended life)** Less heating increases insulation life (**Environmental**

benefits) Reduces carbon footprint (**Regulatory compliance)** Meets energy efficiency standards (**Reduced cooling requirements)** Lower maintenance costs