

# 23ME704 : Automobile Engineering

## Unit II

### Cooling System, Ignition System & Electrical System

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**NARSIMHA REDDY ENGINEERING COLLEGE**  
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# Cooling System

## Cooling System

**Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative cooling – pressure sealed cooling – antifreeze solutions.**

# Ignition System

**Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points, condenser, and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism**

# Electrical System

**Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.**

# THERMAL MANAGEMENT PRINCIPLES

## Overheating Prevention

Engine components operate at temperatures near 2000°. Excessive heat leads to cylinder head warping, piston seizure, and lubrication breakdown.

## Operating Range

Over-cooling causes fuel condensation and high friction. Systems must maintain 80° to 95° for optimal thermal efficiency.

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# THE FORCED CIRCULATION CIRCUIT

## **Radiator**

Compact heat exchanger utilizing core tubes and fins to dissipate thermal energy into the atmosphere via convection.

## **Water Pump**

Centrifugal-type unit belt-driven by the crankshaft, forcing coolant through the engine water jackets at high velocity.

## **Thermostat**

Temperature-sensitive valve that bypasses the radiator during warm-up to achieve operating temperature rapidly.

# RADIATOR COOLING EFFICIENCY

<b>Natural Convection (0 m/s)</b>	<b>15%</b>
<b>Low Airflow (2 m/s)</b>	<b>45%</b>
<b>Medium Airflow (4 m/s)</b>	<b>78%</b>
<b>High Airflow (6 m/s)</b>	<b>95%</b>

# THE IGNITION ARCHITECTURE

The Battery Ignition System serves as the standard for SI engines, converting low-voltage DC into high-voltage energy surges.

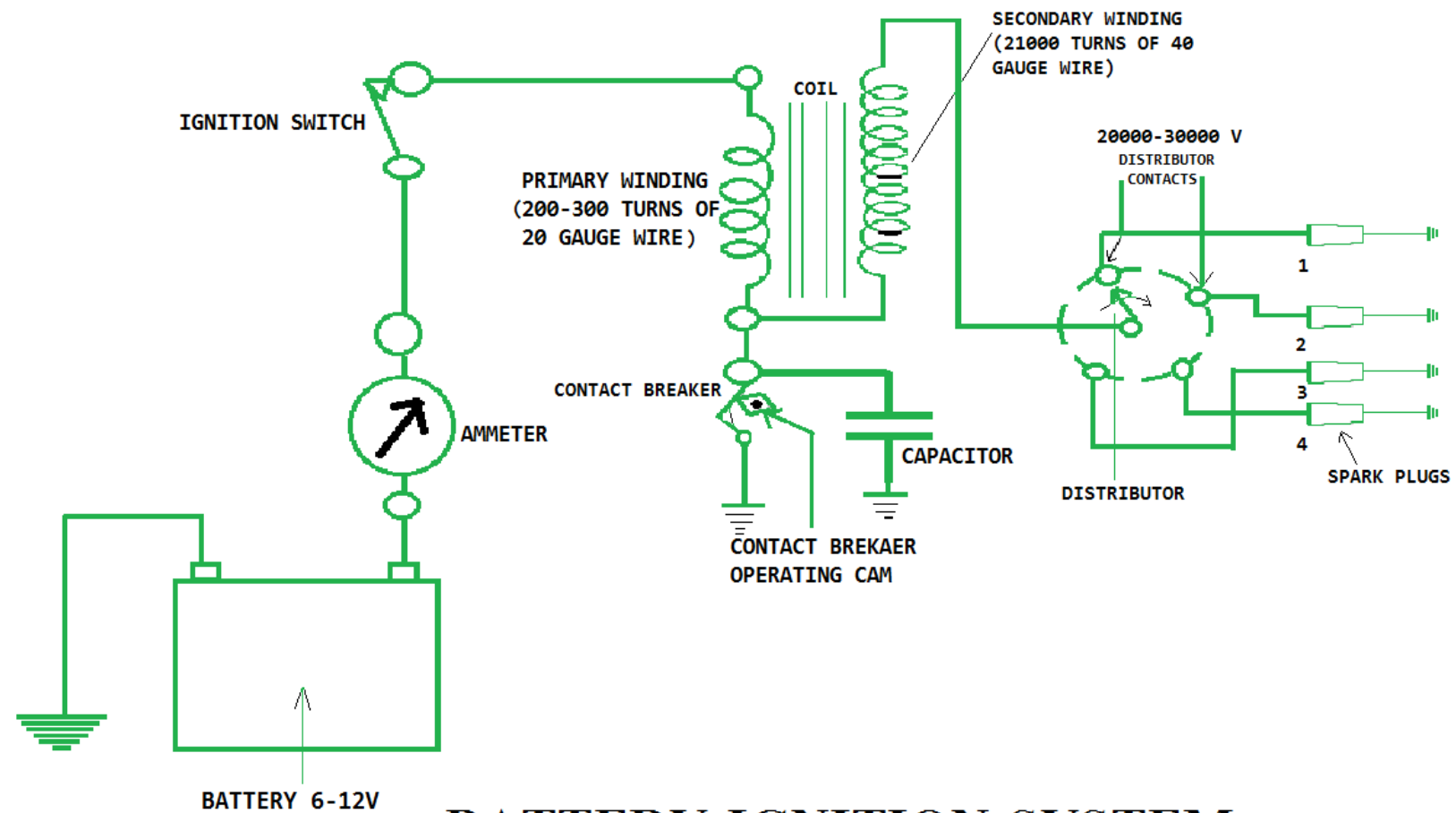
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**Ignition Coil:** 12V to 30kV step-up transformer.

**Condenser:** Absorbs surge to prevent contact arcing.

**Spark Plug:** High-tension discharge gap.

# Ignition System



**BATTERY IGNITION SYSTEM**

# POWER & AUXILIARY CIRCUITS

**Charging Circuit:** Uses an Alternator and Voltage Regulator to maintain energy levels.

**Bendix Drive:** Inertia-based engagement of the starter pinion to the flywheel ring gear.

**Instrumentation:** Critical feedback loops for Oil Pressure, Fuel, and Engine Temp.