

Written Test (MCQ) Structure

OF

ONE YEAR FULL TIME POST GRADUATE DIPLOMA IN ELECTRIC MOBILITY (PGD-EM)

Group A: Applicable to following Engineering Streams:

Electrical Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Mechatronics and Allied Branches

	PART I	PART II	TOTAL
Marks	80	20	100
Questions	80	20	100
Time	90 Minutes	30 Minutes	2 Hours
Pattern	MCQs	MCQs	-

Group B: Applicable to following Engineering Streams:

Mechanical Engineering, Automobile Engineering and Allied Branches

	PART I	PART II	TOTAL
Marks	20	80	100
Questions	20	80	100
Time	30 Minutes	90 Minutes	2 Hours
Pattern	MCQs	MCQs	-

PART I

Fundamentals of Automotive Electrical and Electronic Systems

- **Basics of Circuit Element Analysis:** Electric circuit elements, KVL, KCL, series-parallel connections, superposition theorems, equivalent circuit.
- **Basics of Electrical Concepts:** Steady state and transients in ac and dc, power in ac and dc circuits, power factor improvement, poly phase ac circuit, concept of phasors and phasor diagram, magnetic circuits and transformers.
- **Semiconductor Components:** Characteristics and applications of Diode, Zener diode, BJT, SCR and MOSFET. DC Power supply.
- **Linear Integrated Circuits:** Simple circuits using OPAMP, elementary treatment to multi-vibrator, filters Schmitt trigger, feedback amplifiers, oscillators etc.
- **Digital Electronics:** Boolean logic, basic gates, truth tables, K maps, combinatorial and sequential circuits, DAC and ADC, introductory Boolean Algebra and switching functions,

finite state machines, design of synchronous FSMs, FSM minimization, asynchronous FSMs. Bipolar Logic Families, MOS logic families, and their electrical behavior.

- **Memory and Synchronous Timing Circuits:** Memory Elements, Timing circuits, Elementary combinational and sequential digital circuits: adders, comparators, shift registers, counters. Logic Implementation using Programmable Devices.
- **Automotive Applications: Motors, Batteries and Lamps, Ignition & Injection System:** Working principle and construction of ac and dc machines used in automobile applications, lamps used in automobile applications. Batteries and Starting system. Electronic Ignition and Injection System.

PART II

Mechanical & Automotive Engineering

Mechanical Engineering:

- **Applied Mechanics:** Engineering Mechanics: Equilibrium; trusses and frames; kinematics and dynamics of particles & rigid bodies in plane motion, linear and angular impulse & momentum and impact. Strength of Material: Stress and strain, stress-strain relationship, elastic constants, bending and shear stresses; deflection of beams; torsion of circular shafts; Eulers theory of columns; strain energy methods; thermal stresses.
- **Applied Design:** Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels. Vibrations: Free and forced vibration of single degree of freedom systems; damping; vibration isolation; resonance, critical speeds of shafts. Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements.
- **Fluid Mechanics & Heat Transfer:** Fluid Mechanics: Fluid properties; fluid statics and dynamics; Bernoullis equation; boundary layer; elementary turbulent flow. Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, unsteady heat conduction, fins; free and forced convective heat transfer, thermal boundary layer; effect of turbulence; radiative heat transfer; heat exchanger.
- **Thermodynamics:** Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle; calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion, Rankine, Brayton cycles I.C. Engines Otto, Diesel and dual cycles, Vapour refrigeration cycle and heat pumps.
- **Material & Manufacturing:** Engineering Materials: Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials. Manufacturing Process: Metal casting, forming, welding, joining, machining and machine tool operations.

Automotive Engineering:

- **Chassis & Body:** Classification of vehicle, vehicle chassis & body, pillars, crashworthiness, vehicle safety, vehicle interior systems and materials.

- **Transmission, Driveline & Axles:** Clutches, torque converter, manual gear boxes, AMT and automatic transmission, drives, propeller shaft, universal joints, differential, wheels, tyres, front and rear axles.
- **Steering, Suspension & Brake:** Steering systems, steering gear box, steering geometry, steering mechanism. Suspension systems, types, conventional and independent suspensions, air suspension. Brake systems, types, disc brake, drum brake and Antilock Braking System.
- **Automotive Engines & Emissions:** SI & CI engines, Otto, diesel and dual cycles. Two and four stroke engines, firing order and Combustion. Fuel Systems, cooling systems, lubricating systems. Emission formation in SI & CI engines, After-treatment Devices, Charcoal Canister Control, Positive crank case ventilation system and EGR Systems.
- **Alternate Fuel Vehicles:** Fuel properties: CNG, LPG, LNG, alcohol, bio-fuels, biogas and hydrogen. Fuel cell, electric, hybrid and smart vehicles.
- **Automotive Electrical Systems:** Battery, alternator, stator, ignition system, solenoid switch, lighting systems, horn, wiper, wiring harness, sensors, actuators and ECU.
