TAMIL NADU PUBLIC SERVICE COMMISSION
SYLLABUS
TRADE - MECHANIC MOTOR VEHICLE (MMV)
(ITI STANDARD)

CODE: 437

Unit- I: Safety Precautions and First Aid: Importance of Safety and general Precautions to be observed in the shop. Basic first aid, safety signs. Safe handling of Fuel Spillage, Fire extinguishers and its types. Different types of fire. Safe disposal of toxic dust, Safe handling and Periodic testing of lifting equipment, Authorization of Moving & road testing vehicles. Electrical safety tips.

Unit-II: Hand Tools and Measuring Instruments, Frame and Body::- Marking materials, Cleaning tools, Workshop tools, Common and Special hand tools, Micrometers, Vernier calipers, Telescope gauges, Dial bore gauges, Dial indicators, Straightedge, Feeler gauge, Thread pitch gauge, Vacuum gauge, Tire pressure gauge. Drill bits, Drilling machines and holding devices, Taps and Die sets, Calculation of Tap drill sizes for metric and inch taps. Screw extractors, Hand Reamers and its types. Lapping, Lapping abrasives, Type of Laps. Fasteners.

Function of frame, Types of frame, Chassis repair and alignment, Frame maintenance, Safety standards for cars.

Unit -III: Engine, Transmission system, Fuel supply system, Cooling systems and lubrication system: - Internal & External combustion engines, Classification of IC engines, Principle & working of IC engines. Differentiate between 2- stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Engine Technical terms, Engine specification, Various gauges/instrument on a dash board Petrol Engine. Engine Components and materials: Cylinder head, combustion chambers, Head gaskets, Engine Valves & Valve Trains, Type of valve operating mechanism, Valve- timing diagram, Camshafts & drives, Timing belts & chains, Timing belts tensioners. Pistons, Piston rings and Piston pins. Compression ratio, Connecting rod, Crank shaft, Engine bearings, Fly wheel and vibration damper. Crank case & oil pump, Gears timing mark, Chain sprockets, Chain tensioner etc. Function of clutch & coupling units attached to flywheel. Cylinder block, Sleeves (liner). Intake & Exhaust systems and Components, Firing order of the engine.

Clutch, Gear ratios, Gearbox Automated Manual Transmission (AMT) Gearbox layout & operation, Baulk-ring synchromesh unit, Transaxle synchromesh unit drive transfer case, Freewheeling hubs, Four wheel drive differentials All-wheel drive- four wheel final drives, All-wheel drive transfer case, Transfer case differential action Automatic Transmissions - Torque converters, Planetary gears, Electronic control transmission , Propeller shaft, Universal Joint, Final drive, Differential unit, Rear axle & Front axle.

fuel characteristics, concept of Quiet diesel technology &Clean diesel technology. Diesel fuel system components – Description and function of Diesel tanks & lines, Diesel fuel filters, water separator, Lift pump, Plunger pump, Priming pump, Electronic Diesel control Electronic fuel control systems, Common Rail Diesel Injection (CRDI) system, Sensors, actuators and ECU (Electronic Control Unit) used in Diesel Engines, Gasoline Fuel Systems, Stoichiometric ratio, Air density, CNG –Gas circuit components.

Different type of cooling systems, components- Radiator, Coolant hoses, Water pump, Cooling system thermostat, Cooling fans, Temperature indicators, Radiator pressure cap, Recovery system, Thermo switch. Functions of oil, Viscosity and its grade as per SAE, Oil additives, Synthetic oils, The lubrication system, Splash system, Pressure system, Corrosion/noise reduction in the lubrication system. Lubrication system components - Description and function of Sump, Oil collection pan, Oil tank, Pickup tube, different type of Oil pump & Oil filters Oil pressure relief valve, Spurt holes & galleries, Oil indicators, Oil cooler.

UNIT- IV: Wheels & Tyres, Steering Systems, Suspension Systems, Braking Systems -Wheel, Tyre, Rim and is types, materials, Construction, Characteristics. Tyre sizes & designations, Tyre information, Tyre tread designs, Tyre ratings for temperature & traction. Descriptions Tire wear Patterns and causes Nitrogen v/s atmospheric air in tyres

Principles of steering, Rack-and-pinion steering system, Recirculation ball & nut steering system, Four-wheel steering systems, collapsible steering system. Steering boxes & columns, Power Assisted steering, Electric power assisted steering. Wheel alignment:- Basic principles , wheel base, wheel track, king pin inclination, Caster, Camber, Scrub radius, Toe-in & toe out, Toe-out on turns, Turning radius, Thrust angle &centre lines.

Principles of suspension, Types of suspension Independent suspension, Rear independent suspension, Rear-wheel drive independent suspension, non independent suspension, electronically controlled air suspension (ECAS), Adaptive air suspension operation. Types of springs - Description and function of Coil springs, Leaf springs, Torsion bars, Rubber springs. Shock absorber types- Hydraulic shock absorbers, Gas-pressurized shock absorbers, Load adjustable shock absorbers, Manual adjustable-rate shock absorbers, Electronic adjustable-rate shock absorbers, Automatic load adjustable shock absorbers Front suspension types & components- Mc person Strut suspension, Short/long arm suspension, Torsion bar suspension Rear suspension types & components- Rigid axle leaf spring suspension, Rigid axle coil spring suspension, Independent type suspension, Rigid non-drive suspension.

Brake type - principles, Air brakes, Exhaust brakes, Electric brakes, Parking brakes, Engine brakes, Regenerative braking Braking system. Components brake system. Brake friction materials . Antilock braking

system operation, Principles of ABS braking, CABS master cylinder, Chydraulic control unit, Wheel speed sensors, ABS with EBD electronic control unit. The construction and Operation of ABS. Braking system components.

UNIT – V: Diagnostic Trouble Code (DTC) :- Use of scan tool and retrievals of codes. EFI sensors- Intake Temperature sensor, Mass airflow sensor, Manifold absolute pressure sensor, Air vortex sensor, Fuel system sensor, Throttle position sensor, Exhaust gas oxygen sensor, Crank angle sensor, Hall effect voltage sensor, Optical type sensors.

Unit- VI : Emission Control:- Vehicle emissions Standards- Euro and Bharat II, III, IV, V Sources of emission, Combustion, Combustion chamber design. Types of emissions: Characteristics and Effect of Hydrocarbons, Hydrocarbons in exhaust gases, Oxides of nitrogen, Particulates, Carbon monoxide, Carbon dioxide, Sulphur content in fuels Description of Evaporation emission control, Catalytic conversion, Closed loop, Crankcase emission control, Exhaust gas recirculation (EGR) valve, , Controlling airfuel ratios, Charcoal storage devices, Diesel particulate filter (DPF). Selective Catalytic Reduction (SCR), EGR VS SCR.

UNIT- VII : Battery- Magnetic effects, Heating effects, Thermoelectric energy, Thermisters, Thermo couples, Electrochemical energy, Photo-voltaic energy, Piezoelectric energy, Electromagnetic induction, Relays, Solenoids, Primary & Secondary windings, Transformers, stator and rotor coils. Basic electronics: Description of Semi conductors, Solid state devices- Diodes, Transistor, ignition systems- Distributor less ignition systems, Insulated coils, Distributor less ignition system timing. Horn, Wiper, power window Power door lock, Automatic door lock, Remote keyless entry system, Antitheft system, Immobilizer system circuits and its components. Description and function of Airbags, Seatbelt, Vehicle safety systems, Crash sensors, Seat belt pre tensioners, Tire pressure monitoring systems Integrated communications, Proximity sensors,

UNIT – VIII :Heating Ventilation Air Conditioning (HVAC) :- Principles, Air-conditioning capacity, Air-conditioning refrigerant, Humidity Description and function of Fixed orifice, Control devices, Thermostatic expansion valve system, Thermal expansion valves, Air-conditioning compressors, Condensers & evaporators, Receiver drier, Lines & hoses, TX valve construction, Temperature monitoring thermostat, Refrigerants, Pressure switches, Heating elements Air-conditioning ECU, Ambient air temperature sensor, Servo motors, Electric servo motors, Automatic climate control sensors, Evaporator temperature sensor, Blower speed control, Ventilation systems

UNIT – IX : Basic Electrical and Electric Vehicle Technology:- Electricity principles, Basic Electrical connections, Ohm's law, Voltage, Current, Resistance, Power, Energy. Voltmeter, ammeter, Ohmmeter, Mulitmeter, Conductors & insulators, transformer, Wires, Shielding, Length vs. resistance, Resistor ratings Fuses & circuit breakers, Ballast

resistor, Stripping wire insulation, cable colour codes and sizes, Resistors in Series circuits , Parallel circuits and Series-parallel circuits, Electro static effects, Capacitors and its applications, Capacitors in series and parallel.

Description of charging circuit operation of alternators, regulator unit, ignition warning lamp troubles and remedy in charging system. Description of starter motor circuit, Constructional details of starter motor solenoid switches, common troubles and remedy in starter circuit.

Introduction to Hybrid & Electronic vehicle, Hydrogen fuel cell vehicle, EV Terminology Comparison of Electric Vehicle with IC engine vehicle based on emissions, range, fuel type. Types of electric vehicle, BEV, HEV, PHEV and FCEV. Architecture of Electric Vehicle, working principle of fully electric vehicle, Major component, performance parameter, Basics of Motors, Selection, sizing and characteristic of Motor, calculation for motor effort, electric transmission. Principle, working and operation of propulsion system, DC Motor - Drives Armature Voltage, chopper circuit, step up, Step down chopper, control strategy, chopper amplifier. Brushless DC Motor – principle working, features, speed control system of brushless DC motor, efficiency, calculation. Battery management system

UNIT – X: Traffic rules:- Signals & controls. Locating vehicle information, Obtaining & interpreting scan tool data.