

**DIRECT RECRUITMENT OF ASSISTANT PROFESSOR IN THE  
UNIVERSITY COLLEGES AND REGIONAL CAMPUSES,  
ANNA UNIVERSITY, CHENNAI-25.**

**WRITTEN TEST SYLLABUS FOR THE SUBJECT AUTOMOBILE  
ENGINEERING**

**Section 1 : Engineering Mathematics**

**Determinants and Matrices:** Solving system of equations – Rank of the Matrix – Eigenvalues and eigenvectors – Reduction of quadratic form to canonical form.

**Calculus and Differential Equations:** Partial derivatives – Jacobians – Taylor's expansion – Maxima and Minima. Linear ordinary differential equations with constant coefficients – Simultaneous first order linear equations with constant coefficients. Formation of partial differential equation (PDE) – Solution of first order PDE – Solution of linear higher order PDE with constant coefficients.

**Vector Calculus:** Double and triple integrations and their applications – Gradient, Divergence, Curl and Laplacian – Green's, Gauss divergence and Stroke's theorem.

**Functions of Complex Variables and Complex Integration:** Analytic functions – Conformal Mapping – Bilinear transformation – Cauchy's integral theorem and integral formula – Taylor and Laurent Series – Singularities – Residues – Residue theorem and its applications.

**Transforms:** Laplace Transform – Inverse transforms – Application to solution of linear ordinary differential equations with constant coefficients. Fourier integral theorem – Fourier transform pair – Sine and Cosine transforms - Transform – Inverse Z–transform – Solution of difference equations using Z– transform.

**Numerical Methods:** Solution of linear system by direct and iterative methods – Interpolation and approximation – Numerical Differentiation and Integration – Solving Ordinary Differential Equations.

**Applied Probability:** Probability and Random variables – Standard Discrete and Continuous distribution – Moments – Moment generating function and their properties. Two-Dimensional Random Variables – Covariance – Correlation and Regression.

**Section 2 : Basic Engineering & Sciences**

**Applied Mechanics:** Law of Mechanics – Lamé's theorem – Forces, Moments and Couples – Displacement, velocity and Acceleration – Friction – Moment of Inertia.

**Mechanical Engineering:** Laws of thermodynamics – Open and closed systems – Equation of state – Heat and Work.

**Physics:** Sound – Lattices – Ultrasonic flaw detector – X-ray radiography – Interference Fringes – Planck's quantum theory – Laser and Fibre Optics.

**Material Science:** Fracture – Magnetic and Dielectric materials – Conductor and Semi conductor materials – Ceramic and Super conductor materials.

**Civil Engineering:** Fluid Statics and Dynamics – Boundary Layer – Pumps and Turbines – Environmental Pollution.

**Electrical Engineering:** Ohm's law – Kirchhoff's law – A.C. circuits – D.C. machines – Transformers – Synchronous machines – Instrumentation.

**Computers:** Computer organization – Architecture – Arrays – Pointers – User defined function – C program.

**Chemistry:** Adsorption – Chromatography – Chemical kinetics – Electrochemistry – Spectroscopy – Fuels and Combustion.

### Section 3 : Automobile Engineering

#### **Mechanics:**

Statics of Particles, Equilibrium of Rigid Bodies, Properties of surfaces and Solids, Dynamics of particles, Friction and Element of Rigid Body Dynamics – Basics of Mechanism, Kinematics of Linkage Mechanism, Kinematics of Cam Mechanism, Gears and Gear Trains, Friction, Force Analysis, Balancing and Vibration.

#### **Strength of Materials and Design:**

Stress, Strain and Deformation of solids, Transverse Loading on Beams and Stresses in Beams, Deflection of Beams, Energy Principles, Thin Cylinders and Spherical vessels Torsion – Fundamentals of design for strength and Stiffness of Machine members, Design of Shaft and Couplings, Design of Fasteners and Welded Joints, Design of Spring and Engine parts, Design of Engine parts, Bearing and Flywheel, Design of Transmission system for flexible elements, Spur Gears and Parallel Axis Helical Gears, Bevel, Worm Gears and Crossed Helical Gears, Design of Gear boxes, Design of Cam, Clutches and Brakes.

#### **Thermodynamics:**

Basic concepts and First Law, Second Law, Entropy and Availability, Properties of Steam, Air standard cycles, Otto, Diesel and Dual cycles, Air compressors, Rankine cycle, Brayton cycle, Steam Turbines, Gas Turbine – Steam Nozzle, Refrigeration and air Conditioning, Conduction, Phase Change Heat Transfer and heat Exchangers, Radiation, Refrigeration Cycles, Refrigerants, System Components, VAPOR, Psychrometry, Air Conditioning system.

#### **Production Technology:**

Foundry Technology, Hot and Cold Working, Forging, Principles and Application of Joining Process, Centre Lathe and Special purpose Lathes, Reciprocating Machines, Milling Machines and Gear Cutting, CNC Machine Tools, Part Programming.

#### **Automotive Chassis:**

Front axle types front wheel geometry condition for true rolling motion steering geometry Ackermann and Davis steering. Types of steering gear box. Propeller shaft Universal joints. Final drive differential types. Type of brakes and constructional details. Types of suspension, Independent suspension-front and rear Rubber, pneumatic, hydro-elastic suspension.

**Automotive Transmission:**

Construction and operation of friction clutches. Different types of gear boxes. Fluid couplings and torque converters. Wilson gear box. Hydrostatic drive systems. Electric drive. Continuously Variable Transmission (CVT) types of car bodies classification of bus bodies.

**Vehicle Body Engineering:**

Body optimization techniques for minimum drag. Wind tunnel technology. Classification of vibration, definitions. Single degree of freedom, free, forced and damped vibrations. Rolling resistance, cornering properties of tyres. Directional stability of vehicle Choice of suspension spring rate calculation of effective spring rate. Vehicle suspension in fore and aft. Vehicle ride model, Load distribution.

**Automotive Electrical and Electronics:**

Types of Batteries, Principle, Construction, Starting System. D.C. Generators and Alternators. Regulations for charging Electronic ignition systems. Types of sensors and actuators for automobiles. Microprocessor controlled devices in automobiles. Components for electronic engine management system. PID control types of solid state ignition systems and their operation. Fuel control maps. Open loop control of fuel injection and closed loop lambda control-integrated engine control system. Onboard diagnosis system.

**Automotive Pollution and Control:**

Emission formation in SI and CI Engines. Effects of design and operating variables controlling techniques - constant volume sampling systems. Measurement techniques of HC, CO, NO<sub>x</sub> and Smoke emission. Dilution Tunnel and Sound level meters.

**Alternate Fuels:**

Properties of alcohols, vegetable oils, biogas, natural gas, LPG and hydrogen as engine fuels. Methods of using all the fuels in SI and CI engines. Performance, emission and combustion behavior of the fuels in SI and CI engines.