

SYLLABUS FOR RECRUITMENT TO THE POST OF
REGIONAL TRANSPORT OFFICER

Any one of the following 2 subjects can be chosen

1. Automobile Engineering :

1. Automotive Engines and Components :

Historical Development of automobiles, Heat Engines & their Classification, Two Stroke & Four Stroke Engine petrol & Diesel engines. Cylinder heads and Cylinder Block, Crank case, Manifolds and Mufflers, Piston, Piston rings, Piston pin, Connecting rod, Crank Shaft, Valve and valve mechanisms.

2. Advanced I.C. Engines :

Combustion in Spark Ignition Engines, Combustion in Compression Ignition Engines Equilibrium Charts, Gas Turbine Combustion.

3. Auxiliary Systems :

Carburetion, Gasoline fuel injection, diesel fuel injection, fuel pump and Governors, types of diesel injection systems, manifolds and mixture distribution, cooling systems, lubrication system, lubrication system, supercharging auto turbo charging.

4. Automotive Fuels and Combustion :

Energy Sources, Liquid Fuels, Combustion of Fuels, Petrol and Diesel Fuels, Cycle Analysis, Combustion in S I Engines, Combustion in C.I. Engines, Dual fuel and Multifuel Engines.

5. Automotive Chassis and Suspension :

General consideration relating to chassis layout, Frames, Front axle and Steering System, Propeller Shaft, Differential and Rear axle Brakes, Suspension, Wheels and Tyres.

6. Automotive Transmission :

Power Required for Propulsion, Clutch, Fluid coupling and one way clutches, Hydrodynamic Torque converters, Gear box, Epicyclic Transmission, Hydrostatic Drives, Automatic and Electric Transmission, Hydrostatic Drives, Automatic & Electric Transmissions.

7. Automotive Electrical and Electronic Systems :

Storage Battery, General/Alternator, Starter Motor and Drives, Ignition systems, Wiring and Lighting system, Heating and Air conditioning, Engine management systems, Chassis Electrical Systems.

8. Automotive Air Conditioning :

Air Conditioning Fundamentals, Air Conditioning systems, Load analysis, Air Distribution Systems. Air Routing and Temperature Control, Air Conditioning service, Air Conditioning control.

9. Vehicle Body Engineering and Safety :

Classification of coachwork type, vehicle body materials, Aerodynamics, Load distribution, Interior Ergonomics, Vehicle Stability, Noise and vibration, safety.

10. Mechanical vibrations and vehicle dynamics :

Types of vibration, Undamped free vibration, damped free vibration, forced vibration, vibration measuring instruments and whirling of shafts, Two degree of freedom systems, vehicle vibration and human comfort, Multi degree of freedom systems.

11. Automotive Air Pollution and Control :

Laws and regulations, Mechanism of Pollutant formation in Engines, influence of Fuel Properties, Post Combustion Treatments, effects of air pollution, Sampling procedures, Instrumentation of pollution measurements.

12. **Vehicle Transport Management :**

Historical background, Motor Vehicle act-1988, The infrastructure, Organization and Management, Route planning, Fare collection and Fare Structure, operating cost and types of vehicles, Public relations divisions, vehicle design.

13. **Two and Three wheeler vehicles :**

Types of engines for Two wheelers, Fuel lubrication and Cooling system, Transmission system, Frames and suspension, Brakes and wheels, Electrical system, Two wheelers and Three wheelers, Maintenance.

14. **Engineering Economics and Automotive cost Estimation**

Definition of various economic terms, Demand and Supply, Wages, money and Exchange, Taxation and insurance, interest Depreciation, Costs and Cost Accounting Basis for comparison of alternatives, replacement analysis, Cost Estimation.

15. **Earthmoving Equipments and Tractors :**

Equipments and operation, engine under carriage and suspension, transmissions and final drives. Hydraulics, steering and brakes, earth moving equipments maintenance and safety, methods of selection of equipments.

16. **Autotronics:**

Introduction of mechatronic system, Transducers and sensors, Electrical Actuation systems, Signal Conditioning Introduction to Microprocessors, Organization and Programming and Microprocessor, Microprocessor Timing and interfacing memory and I/O devices, Application and Mechatronics.

17. **Alternative Energy Sources for Automobiles :**

Types of energy sources, Solar energy, Wind energy, Gaseous alternative fuels. Biomass energy. Synthetic

Alternative fuels, Reformulated conventional fuels, introduction to alternative power trains.

18. Maintenance Engineering :

Introduction to maintenance system, Economics in Maintenance, Maintenance of Machinery, Maintenance Planning, Computers in Maintenance, Industrial Safety, Safety standards.

II. MECHANICAL ENGINEERING :

APPLIED MECHANICS AND DESIGN :

1. Engineering Mechanics :

Free body diagrams and equilibrium; trussed and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulation; impact.

2. Strength of Materials :

Stress and strain , stress- strain relationship and elastic contents, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses

3. Theory of Machines :

Displacement, Velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; fly wheels.

4. Vibrations :

Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

5. Machine Design :

Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine

elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

FLUID MECHANICS AND THERMAL SCIENCES :

1. Fluid Mechanics :

Fluid properties; fluid statics manometer, buoyancy; control-column analysis of mass, momentum and energy, fluid acceleration; differential equations of continuity and momentum; acceleration; differential equations of continuity and momentum; acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes bends etc.

2. Heat Transfer :

Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; Dimensionless parameters in free and forced convective heat transfer. Various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

3. Thermodynamics :

Zeroth, First and Second Laws of thermodynamics; thermodynamic system and processes; Carnot cycle irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

4. Applications : Power Engineering :

Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air standard Otto, Diesel cycles.

5. Refrigeration and air-conditioning:

Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. **Turbomachinery:** Pelton – Wheel, Francis and Kaplan turbines impulse and reaction principles, velocity diagrams.

MANUFACTURING AND INDUSTRIAL ENGINEERING :

1. Engineering Materials :

Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

2. Metal casting :

Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design consideration.

3. Metal Forming :

Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk(forging, rolling extrusion, drawing) and sheet (shearing, deep drawing bending) metal forming processes; principles of power metallurgy.

Metal Fabrication :

Physics of welding , brazing and soldering; adhesive bonding ; design considerations in welding.

4. Machining and Machine Tool Operations:

Mechanics of machining, single and multipoint cutting tools, tool Geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures.

5. Metrology and Inspection:

Limits, fits and tolerances; linear and angular measurements, comparators; gauge design; interferometry; form and finish measurements; alignment and testing method; tolerance analysis in manufacturing and assembly.

6. Computer Integrated Manufacturing:

Basic concepts of CAD/ CAM and their integration tools.

7. Production planning and control:

Forecasting Models, aggregate production planning, scheduling, materials requirements planning.

8. Inventory Control :

Deterministic and probabilistic models; safety stock inventory control systems.

9. Operation Research :

Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

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