

**SCHEME & SYLLABUS FOR RECRUITMENT TO THE POST OF SERVICE ENGINEERS IN A.P. MEDICAL & HEALTH TRANSPORT SERVICE**

| <i>Subject</i>   | <i>Maximum Marks</i> | <i>No.of Questions</i> | <i>Duration (Minutes)</i> |
|--|----------------------|------------------------|---------------------------|
| <b><u>PART-A</u></b><br>Written (Objective Type) Examination |                      |                        |                           |
| Paper-1 General Studies                                      | 150                  | 150                    | 150                       |
| Paper-2 : Mechanical Engineering.                            | 150                  | 150                    | 150                       |
| Paper-3 Automobile Engineering                               | 150                  | 150                    | 150                       |
| <b><u>PART-B:</u></b> Interview (Oral Test)                  | 50                   |                        |                           |

**SYLLABUS:**  
**GENERAL STUDIES**

**1. SCIENCE AND TECHNOLOGY:**

- (a) General Science and Technology
- (b) Role and impact of Science and Technology on India's development.

(Questions will cover general appreciation and understanding of matters of everyday observation and experience as may be expected of a well-educated person who has not made a special study of Science and Technology disciplines.)

**2. INDIAN HISTORY AND CULTURE:**

- (a) Modern Indian History from 19<sup>th</sup> century to the present.
- (b) Nationalist Movement and Constitutional development.
- (c) Indian culture and Heritage including Architecture., Fine Arts, Dance forms, Music, Paintings, Folk Arts and Performing Arts.
- (d) History of Andhradesa Society, culture, Geography and Economic Development.

**3. INDIAN POLITY:**

General and broad understanding of the structural (institutions) and functional (Processes) aspects of Indian Political system

**4. INDIAN ECONOMY AND GEOGRAPHY OF INDIA:**

- (a) Structure of National Economy.
- (b) Economic development (including planning) since Independence.
- (c) Economic Reforms.
- (d) Physical, Economic and Social Geography of India.

**5. CURRENT EVENTS:**

Current Events of Regional, National and International importance

**6. GENERAL MENTAL ABILITY (reasoning and analytical abilities)**

## **MECHANICAL ENGINEERING**

### 1. THERMODYNAMICS:

Basic concepts, open and closed systems. Heat and work, Zeroth, First and second law, application to flow and non – flow processes. Entropy, Availability, irreversibility, T-S Relations, Clapeyron and Real gas Equations. Properties of ideal gases and vapours. Air standard cycles, Two stage air compressors, CI and SI Engines, Valve Time diagram, Pre-ignition, Detonation and Diesel Knock, Fuel Injection, Supercharging, Turbo-prop and Rocket Engines. Cooling, Emission and Control. Measurement of calorific value of fuels, Conventional and Nuclear fuels.

### 2. HEAT TRANSFER:

Modes of Heat Transfer. One- Dimensional steady and Unsteady conduction. Composite slab and equivalent resistance. Heat dissipation from extended surfaces. Heat exchangers, Overall Heat Transfer Co-efficient, Empirical correlations for heat transfer in Laminar and Turbulent Flow, Heat Transfer in Free and Forced Convection. Thermal Boundary layer over a flat plate. Fundamentals of diffusive and convective mass transfer. Black body and fundamental concepts of radiation. Shape factor, Network Analysis.

### 3. REFRIGERATION AND AIR-CONDITIONING:

Heat pump, refrigeration cycles and systems, refrigerants, condensers, expansion devices, psychometry, charts and application to air-conditioning, sensible heating and cooling. Effective temperature, comfort indices, load calculations. Solar-refrigeration, duct design.

### 4. STEAM GENERATORS AND TURBINES

Fire-tube and water-tube boilers. Binary-vapour system. Flow of steam through nozzles and diffusors. Dryness fraction, condensation. Various types of turbines, compounding, velocity triangles, partial admission, reheat, regeneration, efficiency and governance. Gas turbines, role of mach number.

### 5. THEORY OF MACHINES:

Kinematic and dynamic analysis of planar mechanisms, hooke's joint, steering gear mechanisms, cams, gears and gear trains. Flywheels, governors, balancing of rotating masses, balancing of single and multi-cylinder engines. Linear vibrations of mechanical systems, transmissibility and vibration isolation. Critical speeds, two-rotor and three-rotor systems.

### 6. MACHINE DESIGN:

Theories of failure, design of cotter joint, keys, splines, welded joints, threaded fasteners, bolt of uniform strength, screw jack. Design of bearings, couplings, clutches, belt drivers and spur gear systems. Hydro-dynamic and anti-friction bearings. Design of shafts for combined loads. Helical and Leaf springs. Thin and thick-walled pressure vessels.

### 7. PRODUCTION ENGINEERING:

Metal Forming, Basic principles of forging, drawing and extrusion, high energy rate forming. Powder Metallurgy. Metal Casting: Die Casting, Investment Casting, Shell molding, centrifugal casting, gating and riser design, melting furnaces. Fabrication processes: principles of gas, arc and shielded arc welding, advanced welding processes, weldability, metallurgy of welding. Metal cutting: turning, methods of screw production, drilling boring, milling, gear manufacturing, production of flat surfaces, grinding and finishing processes. Computer integrated manufacturing systems – CNC, DNC, FMS, Automation and Robotics, CAD/CAM.

Cutting tool materials, tool geometry, mechanism of tool wear, tool life and machinability, measurement of cutting forces, economics of welding. Unconventional machining processes. Jigs and Fixtures. Fits and Tolerances. Measurement of Surface Texture. Comparators Alignment Tests and Reconditioning of Machine Tools.

8. INDUSTRIAL ENGINEERING:

Production Planning and Control: Forecasting, Moving Averages, Exponential Smoothing, Operations, scheduling, assembly line balancing, product development, break-even analysis, capacity planning, PERT and CPM. Control operations: Inventory control, ABC analysis, EOQ model, material requirement planning, job design, job standards, work measurement, quality management, quality analysis and control. Operations Research: Linear Programming- Graphical and Simplex methods. Transport and Assignment models. Single server queuing model. Value Engineering: Value analysis for Cost Value.

9. ELEMENTS OF COMPUTATION:

Computer organization, flow-charting, features of common computer languages- FORTRAN, d Base III, Lotus – 1-2-3, C and Elementary programming.

**PAPER-II: AUTOMOBILE ENGINEERING**

1. ENGINE TYPES AND CONSTRUCTION FEATURES

Components of four-wheeler automobiles, chassis and body-power unit- power transmission- rear wheel drive, front wheel drive, four-wheel drive- types of automobile engines and engine construction.

2. LUBRICATION SYSTEMS

Engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps-crank case ventilation- engine service, reboring, decarbonisation, nitriding of crank shafts.

3. FUEL SYSTEM- SI ENGINES

Fuel supply systems, mechanical and electrical fuel pumps- filters- carburettors- types-m air filters- petrol engines- petrol injection.

4. FUEL SYSTEM-CI ENGINES

Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps.

5. COOLING SYSTEM

Cooling requirements, air-cooling, liquid-cooling, thermo, water and forced circulation systems- radiators- types- cooling fan- water pump, thermostat, evaporating cooling- pressure sealed cooling, anti-freeze solutions.

6. 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 trigger retard mechanism.

7. ELECTRICAL SYSTEM

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

8. TRANSMISSION SYSTEM

Clutches, principle, types, cone clutch, single plate clutch, multi-plate clutch, magnetic and centrifugal clutches, fluid flywheel- gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, overdrive torque converter. Propeller shaft- Hoatch- kiss Drive, Torque tube drive universal joint, differential rear axles – types- wheels and tyres.

9. STEERING SYSTEM

Steering geometry – camber, castor, king pin rake, combined angle toein, centre point steering. Types of Steering mechanism- Ackerman Steering Mechanism, Davis Steering Mechanism, Steering gears- types, steering linkages.

10. SUSPENSION SYSTEM

Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

11. BRAKING SYSTEM

Mechanical brake system, Hydraulic brake system, master cylinder, wheel cylinder tandem master cylinder. Requirement of brake fluid. Pneumatic and vacuum brakes.

12. EMISSION FROM AUTOMOBILES

Emission from automobiles – pollution standards- National and International- Pollution Control- Techniques – Noise Pollution and Control.

13. MAINTENANCE

Maintenance- general, preventive and daily.

14. LATEST TRENDS

Electronic Ignition, PCBS, Direct Injection, MPFI, Electronic warning systems with aid of sensors, alternators, CNG conversion, repowering.

15. RUNNING MECHANISM & DRIVING SKILLS

Running mechanism and driving skills.

16. OVERHAULING OF UNITS

Engine-transmission-cooling-electrical, brake systems, etc.

*Sd/- Adhar Sinha, IAS.,*  
**SECRETARY**

//f.b.o.//

**ASSISTANT SECRETARY**