

NATIONAL REMOTE SENSING CENTRE
ADVERTISEMENT NO.NRSC/RMT/3/2017 DATED 20.05.2017

Name of the Post: Technician – B (Motor Mechanic)

Post Code: TB 7

SYLLABUS - WRITTEN TEST

Type of Examination	:	Objective Type (Multiple Choice Questions)
No. of Questions	:	80 Questions
Apportionment of marks	:	Each Question carries one mark
Duration of Examination	:	02 Hours

Qualification Requirement: ITI/NTC/NAC in Motor Mechanic Trade

(Examination will broadly comprise of below mentioned topics as covered in ITI/NTC/NAC in Motor Mechanic trade)

1. Importance and use of basic first aid, safety signs for danger, warning, caution and personal safety. Safe handling of fuel spillage and knowledge of fire extinguishers used for different types of fire. Safe disposal of toxic dust, safe handling and periodic testing of lifting equipment.
2. Introduction to Hand & power tools (calipers, dividers, surface gauges, scribe, punches, chisel-flat, cross-cut, hammer, mallet, Screw drivers, allen key, bench vice & c-clamps, spanners, sockets & accessories, pliers, air impact wrench, air ratchet, wrenches- torque wrenches, pipe wrenches, car jet washers pipe flaring & cutting tool, pullers-gear and bearing, micrometers, vernier calipers), Fasteners (screws, nuts, studs & bolts, locking devices, such as lock nuts, cotter, split pins, keys, circlips, lock rings, lock washers), Cutting tools (hacksaw, file)
3. Introduction to Limits, fits & tolerances with examples used in auto components
4. Drilling machine - description and use of bench type drilling machine, portable electrical drilling machine, drill holding devices, work holding devices, drill bits, taps and dies, hand reamers.
5. Sheet metal - Common metal sheets used in sheet metal shop - shearing, bending, drawing, squeezing,
6. Sheet metal joints - hem & seam joints, fastening methods - riveting, soldering, brazing. Fluxes used on common joints, Sheet and wire-gauges.
7. Basic electricity - electricity principles, ohm's law, voltage, current, resistance, power, energy. conductors & insulators, parallel circuits and series-parallel circuits, electrostatic effects, capacitors and its applications, capacitors in series and parallel, batteries, thermistors, thermo couples
8. Basic electronics: description of semi-conductors, solid state devices- diodes, transistors, thyristors, UJT, MOSFETS, logic gates-or, and & not and logic gates using switches.
9. Welding processes – principles of arc and oxy-acetylene welding, brief description, classification and applications.
10. Heat treatment process– introduction, definition of heat treatment, annealing, normalizing, hardening and tempering. Case hardening, nitriding, induction hardening and flame hardening process used in auto components.
11. Non-destructive testing methods- importance of non-destructive testing in automotive industry, liquid penetrant and magnetic particle testing method – portable yoke method

12. Introduction to hydraulics & pneumatics: - definition of pascal law, pressure, force, viscosity, gear pump-internal & external, single acting, double acting & double ended cylinder; control valves used in automobile. Pneumatic symbols, description and function of air reciprocating compressor
13. Materials – stress, strain,- definition of stress, types of stress- tensile, compressive, shear , examples of the three basic stresses in automotive components , calculation of stress and strain in automotive application, strain-, tensile, compressive, shear strain, tensile strength, factor of safety, torsional stress, strain energy.
14. Definition of cold working and hot working and its properties on sheet metal. Advantage of deep drawing material. Importance of iron- carbon diagram in heat treatment process.
15. Forces – types, graphical representation, addition, resolution of forces, mass, equilibrium, pressure, pressure in hydraulic systems, hooke's law, practical applications.
16. Work energy, power– calculation of work, power and work done by a torque, definition and calculation of energy -potential energy, chemical energy, conservation of energy, energy equation, kinetic energy, energy of a falling body, kinetic energy of rotation.
17. Introduction to engine- Description of internal & external combustion engines, , principle, working and differences between 2&4-stroke diesel engine, principle of spark ignition engine, direct injection and indirect injection.
18. Diesel engine components, types of valves & valve trains, Description & functions of different types of pistons, connecting rod, crank shaft, camshaft, fly wheel and vibration damper, clutch & coupling units attached to flywheel, Gearbox layout & operation , different types of wheel drives, cylinder block, cylinder block construction, and different type of cylinder sleeves (liner), steering system, suspension system, braking system. Engine assembly procedure with aid of special tools and gauges used for engine assembling.
19. Introduction to gas turbine, comparison of single and two stage turbine engine, different between gas turbine and diesel engine.
20. Need for cooling systems, basic cooling system components- Need for lubrication system, Intake & exhaust systems components– description and function.
21. Emission control- vehicle emissions
22. Balancing and vibrations – balance of rotating masses acting in the same plane (coplanar). Engine balance, simple harmonic motion (SHM), applications of SHM- vibration of a helical coil spring, torsional vibration, free vibrations, example of free vibrations, forced vibrations- resonance, driveline vibrations, damping, vibration dampers, dual mass flywheel, cams.
23. Petrol engine basics: 4-stroke spark-ignition engines- basic 4-stroke principles.
24. Spark-ignition engine components, Intake & exhaust systems, Carburetor operation, Carbureted system components
25. Introduction to electronic fuel injection (EFI) fuel supply , EFI fuel supply system components, sensors
26. Ignition principles and faraday's laws, primary and secondary winding of transformer, ignition components, spark plugs, spark plug components, vacuum & centrifugal units, plug firing voltage,
27. Introduction, principles and working of Charging system, Starting system, Lighting system,

28. Heating ventilation air conditioning (hvac) legislation, vehicle heating, ventilation & cooling systems, basic air-conditioning 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, temperature monitoring thermostat, refrigerants, pressure switches, heating elements
29. Concepts of elasticity, malleability, brittleness, hardness, compressibility & ductility and their examples , properties and uses of cast iron, ferrous metal, gray cast iron, white cast iron, wrought iron, and plain carbon steel, high speed steel and alloy steel.

Syllabus for Skill Test

1. Use of general workshop tools & power tools.
2. Use of cutting tools for making a particular design using tools like hacksaw, file, chisel, sharpening of chisels, center punch.
3. Measurement of various engine components using outside Micrometers, depth micrometer, telescope gauges, dial bore gauge, feeler gauge.
4. Pipe bending, fitting nipples unions in pipes. Soldering and Brazing of Pipes.
5. Joining wires using soldering Iron, Construction of simple electrical circuits, Measuring of current, voltage and resistance using digital multimeter, practice continuity test for fuses, jumper wires, fusible links, circuit breakers.
6. Preparing straight beads and Butt, Lap & T joints Manual Metal Arc Welding.
7. Mathematics concepts: Units, Fractions, ratio and proportion, time and work problems, geometry, trigonometry, statistics
8. Description of manufacturing process of steel, and aluminum
9. Problems on force, work, energy, power, aluminium and steel manufacturing
10. Problems on heat and temperature, heating, expansion and compression of gases
11. Numericals on fuels and combustion, IC engine concepts of horsepower, mean effective pressure, torque, brake power, mechanical. Volumetric efficiency of engine
12. Engineering drawing: different types of lines, projections, development of surfaces, free hand sketching of various IC engine components, fits and tolerances
13. Problems on levers and moments, torque and gears, friction, velocity and acceleration, speed, force, mass and acceleration, vehicle dynamics, balancing, vibrations
14. Basic electrical principles, electrical circuits, capacitors and resistors, LED
15. CAD and modeling introduction (2D wire frame, surface modeling, co-ordinate systems)

(Sridevi Ch)
Co-opted Member

(Jaya Thakur)
Co-opted Member

(Latha James)
Member

(S Nageswara Rao)
Member

(Elango E)
Member

(Sita Kumari E.V.S)
Member

(S Muralikrishnan)
Member

(D Vijayan)
Chairman

Approved / Not Approved

Director, NRSC