

SYLLABUS FOR WRITTEN COMPETITIVE EXAMINATION OF TECHNICIAN-I (GR. II).

Scheme for Written Competitive Examination

Mode of Examination- OMR Based or Computer Based Objective Type Multiple Choice Examination

Medium of Questions- The questions will be set both in English and Hindi except the questions on English Language.

Standard of exam- SSC+ITI / XII Standard

Total No. of Questions- 150

Total Time Allotted- 2 hours 30 minutes.

Paper-I (Time Allotted-1 hour)

Subject	No. of questions	Maximum Marks	Negative Marks
Mental Ability Test*	50	100 (Two marks for every correct answer)	<u>There will be no negative marks in this paper</u>

*Mental Ability Test will be so devised so as to include General Intelligence, Quantitative Aptitude, Reasoning, Problem Solving, Situational Judgement, etc.

Paper-II (Time Allotted-30 minutes)

Subject	No. of questions	Maximum Marks	Negative Marks
General Awareness	25	75 (Three marks for every correct answer)	One negative mark for every wrong answer
English Language	25	75 (Three marks for every correct answer)	One negative mark for every wrong answer

Paper-III (Time Allotted-1 hour)

Subject	No. of questions	Maximum Marks	Negative Marks
Concerned Subject	50	150 (Three marks for every correct answer)	One negative mark for every wrong answer

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SYLLABUS FOR WRITTEN COMPETITIVE EXAMINATION

Paper-I (Time Allotted – 1 hour)

Subject	No. of question	Maximum Marks	Negative Marks
Mental Ability Test*	50	100 (two marks for every correct answer)	There will be no negative marks in this paper.

*Mental Ability Test will be so devised so as to include General Intelligence, Quantitative Aptitude, Reasoning, Problem Solving, Situational Judgement, etc.

It would include questions of both verbal and non-verbal type. The test will include questions on Semantic Analogy, Symbolic operations, Symbolic/ Number Analogy, Trends, Figural Analogy, Space Orientation, Semantic Classification, Venn Diagrams, Symbolic/ Number Classification, Drawing inferences, Figural Classification, Punched hole/ pattern-folding & unfolding, Semantic Series, Figural Pattern-folding and completion, Number Series, Embedded figures, Figural Series, Critical Thinking, Problem Solving, Emotional Intelligence, Word Building, Social Intelligence, Coding and de-coding, Other sub-topics, if any Numerical operations.

Number Systems: Computation of Whole Number, Decimal and Fractions, Relationship between numbers.

Fundamental arithmetical operations: Percentages, Ratio and Proportion, Square roots, Averages, Interest (Simple and Compound), Profit and Loss, Discount, Partnership Business, Mixture and Allegation, Time and distance, Time and work.

Algebra: Basic algebraic identities of School Algebra and Elementary surds (simple problems) and Graphs of Linear Equations.

Geometry: Familiarity with elementary geometric figures and facts: Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle, common tangents to two or more circles.

Mensuration: Triangle, Quadrilaterals, Regular Polygons, Circle, Right Prism, Right Circular Cone, Right Circular Cylinder, Sphere, Hemispheres, Rectangular Parallelepiped, Regular Right Pyramid with triangular or square Base.

Trigonometry: Trigonometry, Trigonometric ratios, Complementary angles, Height and distances (simple problems only) Standard Identities like $\sin^2\theta + \cos^2\theta = 1$ etc.,

Statistical Charts: Use of Tables and Graphs: Histogram, Frequency polygon, Bar-diagram, Pie-chart.

Paper-II (Time Allotted – 30 minutes)

Subject	No. of question	Maximum Marks	Negative Marks
General Awareness	25	75 (three marks for every correct answer)	One negative mark for every wrong answer
English Language	25	75 (three marks for every correct answer)	One negative mark for every wrong answer

1.0 **General Awareness:** Questions are designed to test the candidate's general awareness of the environment around him and its application to society. Questions are also designed to test knowledge of current events and of such matters of everyday observation and experience in their scientific aspect as may be expected of an educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General policy and scientific research.

2.0 **English Language:** Spot the Error, Fill in the Blanks, Synonyms/ Homonyms, Antonyms, Spellings/ Detecting mis-spelt words, Idioms & Phrases, One word substitution, Improvement of

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Sentences, Active/Passive Voice of Verbs, Conversion into Direct/ Indirect narration, Shuffling of Sentence parts, Shuffling of Sentences in a passage, Cloze Passage, Comprehension Passage

Paper – III (Time Allotted – 1 hour)

Subject	No.of questions	Maximum Marks	Negative Marks
Concerned Subject*	50	150 (three marks for every correct answer)	One negative mark for every wrong answer

*Syllabus of the concerned subjects (trades) are given below from 'A' to 'B'.

A. Machinist

1. Safe working practices, environment regulation and housekeeping.
2. Planning and organizing the work to make job as per specification applying different types of basic fitting operation and checking for dimensional accuracy.
3. Procedure for making different fit of components for assembling as per required tolerance observing principle of interchange-ability and checking for functionality.
4. Procedure for producing components by different operations and check accuracy using appropriate measuring instruments.
5. Procedure for setting different shaped jobs on different chuck and demonstrating conventional lathe machine operation observing standard operation practice.
6. Procedure for preparing different cutting tool to produce jobs to appropriate accuracy by performing different turning operations.
7. Procedure for setting different components of machine & parameters to produce taper/ angular components and ensuring proper assembly of the components.
8. Procedure for setting the different machining parameters to produce metric-v threaded components applying method/ technique and test for proper assembly of the components.
9. Procedure for setting the different machining parameters and cutting tool to prepare job by performing different slotting operation.
10. Procedure for setting the different machining parameters and cutters to prepare job by performing different milling operation and indexing.
11. Procedure for setting the different machining parameters to produce square & "V" threaded components applying method/ technique and testing for proper assembly of the components.
12. Procedure for producing components of high accuracy by different operations using grinding.
13. Procedure for re-sharpening different single & multipoint cutting tool.
14. Procedure for setting different machining parameters and cutters to prepare job by different milling machine operations.
15. Procedure for setting the different machining parameters and cutters to prepare components by performing different milling operation and indexing.
16. Identification and explanation of basic functioning of different electrical equipment, sensors and applying such knowledge in industrial application including basic maintenance work.
17. Procedure for setting (both job and tool) CNC turning centre and produce components as per drawing by preparing part programme.
18. Procedure for setting CNC VMC (vertical machining centre) and produce components as per drawing by preparing part program
19. Planning and performing simple repair, overhauling of different machines and check for functionality.
20. Procedure for setting the different machining parameters and cutters to prepare components by performing different milling operation and indexing.

B. Electrical

i. Electronics Circuit

1. Basic electronics- 'P' & 'N' type of semiconductor materials, P-N-junction, Diode classification, Reversed Bias and Forward Bias, Heat sink, PIV rating.
2. Explanation and importance of DC Half wave rectifier circuit, full wave rectifier circuit, bridge rectifier circuit and solar cell.
3. Filter circuit, operating principle of oscilloscope.
4. Principle of transistors-types, characteristics, biasing, use, specification and its rating.
5. Transistor amplifiers- class A, B and C and power amplifier.
6. Op-amp working principle and application, Timer IC 555.
7. Introduction of basic concept of ICs, U.J.T., F.E.T., basic concept of power electronics devices e.g. S.C.R. Diac, Triac, power MOSFET, G.T.O & I.G.B.T.
8. D.C/A.C Power control using power transistor, thyristor, Voltage stabilizer, U.P.S. DC/AC motor drives using transistor/thyristor, Voltage regulator.
9. Digital Electronics: Binary numbers, logic gates and combinational circuits, flip-flops, counter, register & timer.

ii. Electrical Machines

1. Transformer: Working principle of transformer, classification C.T., P.T. Instrument and Auto Transformer/Variac, Single phase and Poly phase.
2. E.M.F. equation, turn ratio, regulations and efficiency, parallel operation of transformer, their connections.
3. Transformers construction - windings, principle of different windings, cores winding shielding, cooling of transformers, auxiliary parts breather, conservator buckholz relay and other protective devices.
4. Transformer oil testing and Tap changing off load and on load, Dry transformer, Transformer bushings and termination. Transformer bushing and termination and specifications of transformers.
5. D.C. Machines: General concept of Electrical Machines. Principle of D.C. generator, Use of Armature, Field Coil, Yoke, Commutator, slip ring Brushes, Laminated core, pole pitch, coil pitch, back pitch, front pitch, Winding-Lap & Wave winding, Progressive and retrogressive winding
6. Explanation of D.C. Generators, types, parts, E.M.F equation, self-excitation and separately excited Generators-Practical uses. Brief description of series, shunt and compound generators.
7. DC Motors -Torque, speed, back e.m.f, their relations practical applications. Armature reaction, interpoles and their uses, connection of interpoles, commutation in DC motor.
8. Types, characteristics and practical application of D.C. motors. Special precaution to be taken in DC Series motors, starters used in D.C. motors.
9. Types of speed control of DC motors in industry control system, AC-DC, DC-DC control, Thyristor/electronic controls.
10. AC machines: Explanation of alternator, prime mover, types, regulations, phase sequence, specification of alternators and brushless alternator, Induction generator, Automatic Voltage Regulator.
11. A.C machines winding—Armature winding, coil side, end coil and grouping of coils. Connection to adjacent poles, connected armature winding, alternate pole connection.
12. Synchronous Motor - Working principle, effect of change of excitation and load, Application in industry in power factor improvement.

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13. Induction motor – Working principle, Squirrel Cage Induction motor, Slip-ring induction motor- Construction and characteristics, starting and speed control, D.O.L Starter, Star /Delta starter, Autotransformer starter.
14. Single phase induction motor- Working principle, different method of starting, operation, running, and reversing (capacitor start/capacitor run, shaded pole technique), FHP motors.
15. Converter-inverter, M.G. Set description-Characteristics, specifications-running and maintenance. Solid state controller and inverters.
16. Universal motor-advantages, Principle, characteristics, applications in domestic appliances and industry, Fault Location and Rectification, Braking system of motor.

iii. Electrical System and protections

1. Alternating Current -Comparison D.C & A.C., Advantages of Alternating current & related terms frequency Instantaneous value, R.M.S. value, average value, Peak factor, form factor, Generation of sine wave, phase and phase difference.
2. Inductive & Capacitive reactance: X_L & X_C , Impedance (Z), power factor (p.f); phasor diagram.
3. Active and Reactive power, Simple problems on A.C. circuits, single phase & three-phase system etc.
4. Problems on A.C. circuits, Both series & parallel power consumption P.F. etc. Concept three-phase Star & Delta connection Line voltage & phase voltage, current & power in a 3 ph circuits, with balanced and unbalanced load. Harmonics: causes & effects.
5. Protections: Fuse / cut out / kit Kat – function, characteristics, and materials, H.R.C Fuses – application.
6. Contactors – Miniature circuit breakers, Relays – Thermal, Electromagnetic, solid state relays, Control Relays and Protective Relays. Different types of contractor and limit switches.

iv Electrical Wiring, Lightening and Earthing

1. Electrical wiring (domestic and industrial): Specifications, grading of cables and current ratings, testing by meggar, voltage drop concept.
2. Principle of laying out domestic wiring, complete house-wiring layout, splitting load wire in multistoried system in accordance with NEC, I.E.E. Rules. Fault finding and troubleshooting of domestic electrical appliances.
3. Industrial wiring, procedure of layout of conduit wiring, code of practice. Wiring of electric motors, control panel, etc.
4. Maintenance and repairing for conduits & accessories, data sheet preparation.
5. Power, control and IT wiring and basic principle of energy audit.
6. Earthing principle, different methods of earthing, and importance of Earthing.
7. Lighting: Explanation of light, white light-illumination factors, intensity of light importance of light, human eye factor units.
8. Types illumination & lamps -Neon sign, Halogen, Mercury vapour, Sodium vapour, Fluorescent tube, CFL, Solar lamp applications, Concept of Energy-Character of wattages, fixing places. Types of lighting.
9. Decoration lighting Drum Switches, Direct & indirect lighting-efficiency in lumens per watt, colour available. Thumb rule calculations of lumens. Estimating the placement of lights, fans and ratings.

v Measurements Instruments

1. Measuring Instruments: Indicating types- moving coil permanent magnet, Moving iron, multi-meter, Wattmeter, Power factor meter.
2. Integrating type energy meter, Digital energy meter, megger, Frequency meter, Phase Sequence indicator, Analog and Digital - C.R.O.
3. Current, Voltage, Power and Energy Measurement in single and poly phase circuits.

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vi Basic Electrical Engineering

1. Fundamental of electricity: Electron theory-free electron, Fundamental terms, definitions, units & effects of electric current, solders, flux and soldering technique.
2. Ohm's Law - Simple electrical circuits and problems, Kirchoff's Laws and applications, Wheatstone bridge principle and its applications.
3. Resistors-Law of Resistance, series and parallel circuits, different types of resistors used in electrical circuits and properties of resistors. Specification of resistance and tolerance. Effect of variation of temperature on resistance. Different methods of measuring resistance.
4. Chemical effect of electric current- Principle of electrolysis, Faraday's Law of electrolysis, basic principles of Electroplating and Electro chemical equivalents, explanation of anodes and cathodes. Lead acid cell-description, methods of charging-precautions to be taken & testing equipment, Ni-cadmium & Lithium cell. Electroplating, anodizing, different types of lead acid cells.
5. Rechargeable dry cell, description, advantages and disadvantages, care and maintenance of cells. Grouping of cells of specified voltage & current, Sealed Maintenance free Batteries, Solar battery, Inverter, Battery Charger, UPS-Principle of working. Lead Acid cell, general defects & remedies, Nickel alkali cell-description charging, Power & capacity of cells. Efficiency of cells.
6. Magnetism: Classification of magnets, methods of magnetizing, magnetic materials, properties, care & maintenance, methods of magnetizing magnetic materials. Para & Diamagnetism and Ferro magnetic materials. Principle of electro-magnetism, Maxwell's corkscrew rule, Fleming's left & right hand rules, Magnetic field of current carrying conductors, loop & solenoid, MMF, Flux density, reluctance. B.H. curve, Hysteresis, Eddy current. Principle of electro-magnetic Induction, Faraday's Law, Lenz's Law.
7. Electrostatics: Capacitor- Different types, functions & uses.
8. Introduction of National Electrical Code 2011 Explanation, Definition and properties of conductors, insulators and semi-conductors, voltage grading of different types of insulators, permissible temperature rise, types of wires & cables standard wire gauge, specification of wires & Cables- insulation & voltage grades-Low, medium & high voltage, precautions in using various types of cables / Ferrules, working principles and circuits of common domestic equipments & appliances.
9. Common electrical accessories, their specifications in line with NEC 2011- Explanation of switches lamp holders, plugs and sockets, developments of domestic circuits, alarm & switches, with individual switches, two-way switch, security surveillance, fire alarm, MCB, ELCB, MCCB etc.

vii General safety and Tool handling

1. Basic safety introduction: Personal protection, basic injury prevention, basic first aid, hazard identification and avoidance, safety signs for danger, warning, cautions & personal safety message.
2. Various safety measures involved in the industry, elementary first Aid, use of fire extinguishers, visit & observation of sections. Concept of Standards in Electrical Engineering, identification of trade-hand tools- specifications.
3. Drilling practice in hand drilling & power drilling machines, grinding of drill bits, practice in using taps & dies, threading hexagonal & square nuts etc., cutting external threads on stud and on pipes, riveting practice.
4. Practice in using snips, marking & cutting of straight & curved pieces in sheet metal, marking use of chisels and hacksaw on flats, sheet metal filing practice, filing true to line, sawing and planning practice. Practice in using firmer chisel and preparing simple half lap joint, bending the edges of sheets metals, riveting practice in sheet metal, practice in making different joints in sheet metal in soldering the joints.

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Hindi Version follows.