



METRO LINK EXPRESS FOR GANDHINAGAR AND AHMEDABAD (MEGA) COMPANY LIMITED

ON-LINE EXAMINATION - RECRUITMENT OF STATION CONTROLLER / TRAIN OPERATOR (SC/TO) & JUNIOR ENGINEER

INFORMATION HANDOUT

This handout contains details pertaining to various aspects of the online exam you are going to undertake and important instructions about related matters. You are advised to study the handout carefully as it will help you in preparing for the examination.

The on-line examination will comprise the following objective type multiple choice tests as stated below :

Sr.No.	Test	No. of Questions	Marks	Duration
Part 1	Gujarati Language	20	20	90 Minutes
	Logical Ability & Reasoning	50	50	
	Quantitative Aptitude	50	50	
Part 2	General English	10	10	45 Minutes
	Technical Knowledge	50	50	
	Total	180	180	

The time for Part 1 the test is 90 minutes and the time for Part 2 is 45 minutes; however you may have to be at the venue for approximately 180 minutes including the time required for logging in, collection of the call letters, going through the instructions etc. You can attempt questions as per time allotted to Part I & II. All the questions will have multiple choices. Out of the five answers to a question only one will be the correct answer. **You have to select the most appropriate answer and 'mouse click' that alternative which you feel is appropriate/correct. The alternative/ option that you have clicked on will be treated as your answer to that question. There will be penalty for wrong answers marked by you in test of Logical Ability & Reasoning, Quantitative Aptitude, General English and Technical Knowledge. For every wrong answer marked by you, 1/4 of the marks assigned to that question will be deducted as penalty. There will be NO penalty for test of Gujarati Language.**

The Scores of Online Examination will be obtained by adopting the following procedure :

- Number of questions answered correctly by a candidate in each objective test is considered for arriving at the Corrected Score after applying penalty for wrong answers.
- The Corrected Scores so obtained by a candidate are made equivalent to take care of the minor difference in difficulty level, if any, in each of the objective tests held in different sessions to arrive at the Equated Scores*

*Scores obtained by candidates on any test are equated to the base form by considering the distribution of scores of all the forms.

Note : Cutoffs may be applied in two stages :

- On scores in individual tests (Only candidates scoring minimum 60% marks (50% for SC/ST/OBC) in part-1 (Gujarati language) will be considered eligible)
- On Total Score

Please note that the types of questions in this handout are only illustrative and not exhaustive. In the actual examination you will find questions of a higher difficulty level on some or all of these types and also questions on the types not mentioned here.

Some sample questions are given below.

**SAMPLE QUESTIONS
PART 1
GUJARATI LANGUAGE**

પ્ર.1-5. શિક્ષણ દ્વારા વિદ્યાર્થીમાં નીતિ, અનુકંપા સમાજ માટે અને પર્યાવરણ માટે... થી શરૂ કરીને નીચેના પાંચ વાક્યો (A), (B), (C), (D) અને (E) ને પુઃઉચિત ક્રમવાર ગોઠવો અને આપેલા પ્રશ્નોના ઉત્તર આપો.

- (A) આજના વિદ્યાર્થીઓ આવતી કાલના નાગરિક છે.
- (B) સહાનુભૂતિ, પ્રામાણિકતા અને કરુણા જેવા સત્વશીલ મૂલ્યો આત્મસાત થવાં જોઈએ.
- (C) નાગરિક પાસેથી એમણે જે વિશ્વમા જીવવાનું છે એને વધુ સારું બનાવવાની અપેક્ષા છે.
- (D) તેથી શાળામાં તેણે સારા વર્તન, સામાજિક જગડકતા, નાગરિક હક્કો અને ફરજો માટે એમને આદર્શ ઉદાહરણ આપવા જોઈએ.
- (E) આ અપેક્ષા પૂરી થાય તેવા ગુણો વિદ્યાર્થીઓ આસપાસના પરિસર અને શાળામાંથી શીખે છે.

પ્ર.1. વાક્યોની પુનઃગોઠવણી કર્યા પછી નીચેનામાંથી કયું વાક્ય પહેલું હોવું જોઈએ ?

- (1) B (2) A (3) C (4) D (5) E

પ્ર.2. વાક્યોની પુનઃ ગોઠવણી કર્યા પછી નીચેનામાંથી કયું વાક્ય બીજું હોવું જોઈએ ?

- (1) B (2) A (3) C (4) D (5) E

પ્ર.3. વાક્યોની પુનઃ ગોઠવણી કર્યા પછી કયું વાક્ય ત્રીજું હોવું જોઈએ ?

- (1) B (2) A (3) C (4) D (5) E

પ્ર.4. વાક્યોની પુનઃ ગોઠવણી કર્યા પછી કયું વાક્ય ચોથું હોવું જોઈએ ?

- (1) A (2) B (3) C (4) E (5) D

પ્ર.5. વાક્યોની પુનઃ ગોઠવણી કર્યા પછી કયું વાક્ય પાંચમું હોવું જોઈએ ?

- (1) A (2) B (3) C (4) E (5) D

LOGICAL ABILITY & REASONING

- Q.1-5.** Read the information given below and answer the questions.
Six plays A, B, C, D, E and F of a famous playwright are to be staged one on each day from Monday to Saturday. The schedule of the plays is to be in accordance with the following.
- (1) A must be on the previous day of the on which E is staged.
 - (2) C must not be staged on Tuesday.
 - (3) B must be on a day which follows the day on which F is staged.
 - (4) D must be staged on Friday only and should not be immediately preceded by B.
 - (5) E must not be staged on the last day of the schedule.
- Q.1.** Which of the following is the schedule of plays, with the order of their staging from Monday ?
(1) E A B F D C (2) A F B E D C (3) A F B C D E
(4) F A B E D C (5) Other than those given as options
- Q.2.** Play C cannot definitely be staged on which of the following days in addition to Tuesday ?
(1) Monday (2) Wednesday (3) Thursday (4) Friday (5) Saturday
- Q.3.** Play D is between which of the following pairs of plays ?
(1) C and E (2) E and F (3) A and E (4) B and E (5) C and F
- Q.4.** Which of the following plays is on Monday ?
(1) E (2) A (3) F (4) B (5) C
- Q.5.** Which of the following plays immediately follows B ?
(1) F (2) E (3) D (4) C (5) A

QUANTITATIVE APTITUDE

This is a test designed to see how fast and accurately you can deal with numbers viz. computation, quantitative reasoning, interpretation of data etc.

- Q.1.** If 3 workers can collect 48 kgs cotton in 4 days, how many kgs of cotton can 9 workers collect in 2 days ?
(1) 216 (2) 32 (3) 108 (4) 72 (5) Other than those given as options
- Q.2.** Sohanlal purchased 120 reams of paper at Rs.100 per ream. The expenditure on transport was Rs.480. He had to pay an octroi duty of 50 paise per ream and the coolie charges were Rs.60. What should be the selling price of each ream if he wants a profit of 20% ?
(1) Rs.126 (2) Rs.115.50 (3) Rs.105 (4) Rs. 120 (5) Other than those given as options
- Q.3.** The interest on a certain deposit at 9% per annum is Rs.405 in one year. How much will be the additional interest in one year on the same deposit at 10% per annum ?
(1) Rs. 40.50 (2) Rs. 450 (3) Rs. 855 (4) Rs.45 (5) Other than those given as options
- Q.4.** The breadth of a rectangular hall is three-fifth of its length. If the area of the hall is 135 sq.m. what is the difference between the length and breadth of the hall in metres ?
(1) 3 (2) 6 (3) 9 (4) 15 (5) Other than those given as options
- Q.5-7.** Study the following table carefully and answer the questions given below —

Distribution of 1000 candidates as regards their marks in written examination out of 300 and interview out of 100 in a selection examination

Written Examination Marks	INTERVIEW MARKS					
	Below 30	30-39	40-49	50-59	60-69	70 & above
260 & above	8	18	26	18	26	4
210 to 259	5	4	30	22	10	9
160 to 209	16	10	45	56	18	9
110 to 159	28	42	100	190	15	5
60 to 109	35	115	20	8	7	5
Below 60	32	32	20	4	6	2

- Q.5.** How many candidates did obtain more than 69 percent marks and above in both written examination and interview ?
(1) 22 (2) 49 (3) 13 (4) 9 (5) Other than those given as options

- Q.6.** if approximately 325 candidates were to be qualified in the written examination, what should be the percentage of the qualifying marks ?
 (1) above 20 (2) above 70 (3) above 36 (4) above 63 (5) Other than those given as options
- Q.7.** About 42 percent of the candidates fall in which of the following ranges of the interview marks ?
 (1) 110-159 (2) 110 & below (3) 50 to 70 (4) 50 & above (5) Other than those given as options

PART 2

GENERAL ENGLISH

This is a test to see how well you know English. Your English language ability would be tested through questions on grammar & vocabulary, synonyms, antonyms, sentence completion, comprehension of a passage etc.

Q.1-2. Read each sentence to find out whether there is any grammatical or idiomatic error in it. The error, if any, will be in one part of the sentence. The number of that part is the answer. If there is no error, the answer is '5'. (Ignore the errors of punctuation, if any).

Q.1. Most of the third world / country are experiencing / the ethnic or communal problem /

- | | | | |
|---------------------|-----|-----|----------|
| (1) | (2) | (3) | No error |
| in varying degrees. | | | (5) |
| (4) | | | |

Q.2. The regaining of freedom / as we well know has given rise for / many dormant issues /

- | | | | |
|-------------------------------|-----|-----|----------|
| (1) | (2) | (3) | No error |
| and conflicts in our society. | | | (5) |
| (4) | | | |

Q.3-4. Pick out from the words given below each sentence the word which would complete the sentence correctly and meaningfully.

Q.3. Continuous unemployment has induced in the people a kind of _____ which is most depressing.
 (1) laziness (2) encouragement (3) satisfaction (4) anger (5) awakening

Q.4. He wants me to look _____ his garden during his absence.
 (1) at (2) over (3) after (4) into (5) from

Q.5-10. In the following passage there are blanks, each of which has been numbered. These numbers are printed below the passage and against each, five words are suggested, one of which fits the blank appropriately. Find out the appropriate word in each case.

The true **(5)** of rights is duty. If we all **(6)** our duties, rights will not be **(7)** to seek. If leaving duties unperformed we run **(8)** rights, they will **(9)** us like an elusive person. The more we pursue them, the farther **(10)** they fly.

- | | | | | | |
|--------------|----------|------------|---------------|-------------|-------------|
| Q.5. | (1) end | (2) source | (3) joy | (4) purpose | (5) power |
| Q.6. | (1) deny | (2) devote | (3) discharge | (4) imagine | (5) fulfill |
| Q.7. | (1) far | (2) close | (3) easy | (4) against | (5) common |
| Q.8. | (1) as | (2) after | (3) at | (4) from | (5) for |
| Q.9. | (1) hold | (2) grab | (3) fight | (4) escape | (5) chase |
| Q.10. | (1) off | (2) can | (3) did | (4) could | (5) towards |

TECHNICAL KNOWLEDGE

Questions will be based on following indicative areas -

MECHANICAL ENGINEERING

Theory of Machines and Machine Design

Concept of simple machine, Four bar linkage and link motion, Flywheels and fluctuation of energy, Power transmission by belts - V-belts and Flat belts, Clutches - Plate and Conical clutch. Gears - Type of gears, gear profile and gear ratio calculation, Governors - Principles and classification, Riveted joint, Cams Bearings, Friction in collars and pivots.

Engineering Mechanics and Strength of materials

Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, Bending moments and shear force diagrams, Stress in composite bars, Torsion of circular shafts, Buckling of columns - Euler's and Rankin's theories. Thin walled pressure vessels

Thermal Engineering

Properties of Pure Substances : p-v & P-T diagrams of pure substance like H₂O, Introduction of steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam. h-s chart of steam (Mollier's Chart).

1st Law of Thermodynamics : Definition of stored energy & internal energy, 1st Law of Thermodynamics for cyclic process, Non Flow Energy Equations, Flow Energy & Definition of Enthalpy. Conditions for Steady State Steady Flow: Steady State Steady Flow Energy Equation.

2nd Law of Thermodynamics : Definition of Sink, Source Reservoir of Heat. Heat Engine. Heat Pump & Refrigerator; Thermal Efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin - Planck & Clausius Statements of 2nd Law of Thermodynamics. Absolute or Thermodynamic Scale of temperature. Clausius Integral, Entropy. Entropy change calculation for ideal gas processes. Carnot Cycle & Carnot Efficiency, PMM-2 ; definition & its impossibility.

Air standard Cycles for IC engines : Otto cycle; plot on P-V, T-S Planes; Thermal Efficiency, Diesel Cycle; Plot on P-V, T-S planes', Thermal efficiency.

IC Engine performance, IC Engine Combustion, IC Engine Cooling & Lubrication.

Rankine cycle of steam : Simple Rankine cycle plot on P-V. T-S. h-s planes, Rankine cycle efficiency with & without pump work.

Boilers; Classification; Specification; Fittings & Accessories : Fire Tube & Water Tube Boilers.

Air compressors & their cycles : Refrigeration cycles; Principle of a Refrigeration Plant; Nozzles & Steam Turbines

Fluid mechanics & Machinery

Properties & Classification of Fluids : ideal & real fluids, Newton's law of viscosity.

Newtonian and Non-Newtonian fluids, compressible and incompressible fluids.

Fluid statics : Pressure at a point.

Measurement of Fluid Pressure : Manometers, U-tube. Inclined tube.

Fluid Kinematics : Stream line, laminar & turbulent flow, external & internal flow, continuity equation.

Dynamics of ideal fluids : Bernoulli's equation. Total head; Velocity head; Pressure head; Application of Bernoulli's equation.

Measurement of Flow rate Basic Principles : Venturimeter, Pilot tube. Orifice meter.

Hydraulic Turbines : Classifications, Principles.

Centrifugal Pumps : Classifications, Principles, Performance.

Production Engineering

Classification of Steels : mild steel & alloy steel, Heat treatment of steel, Welding - Arc Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e. TIG. MIG. etc. (Brazing & Soldering), Welding Defects & Testing; NDT, Foundry & Casting - methods, defecter different casting processes, Forging. Extrusion. etc. Metal cutting principles, cutting tools, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding, Machines, tools & manufacturing processes.

CIVIL ENGINEERING (ONLY FOR POST OF JUNIOR ENGINEER)

Building Materials

Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminum, Fly Ash, Basic Admixtures, Timber, Bricks and Aggregates: Classifications, properties and selection criteria; Cement: Types, Composition, Properties, Uses, Specifications and various Tests; Lime & Cement Mortars and Concrete: Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

Solid Mechanics

Elastic constants, Stress, plane stress, Strains, plane strain, mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses. Bending, Shear and Torsion.

Structural Analysis

Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses; Analysis of determinate and indeterminate structures; Trusses, beams plane frames; Rolling loads. Influence Lines, Unit load method & other methods; Free and Forced vibrations of single degree and multi degree freedom system; Suspended Cables; Concepts and use of Computer Aided Design.

Design of Steel Structures

Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

Design of Concrete and Masonry structures

Limit state design for bending, shear. axial compression and combined forces; Design of beams, Slabs, Lintels, Foundations, Retaining walls. Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

Construction Practice, Planning and Management

Construction - Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works: Tendering Process and Contract Management. Quality Control, Productivity, Operation Cost; Land acquisition; Labor safety and welfare.

Flow of Fluids, Hydraulic Machines and Hydro Power

Fluid Mechanics, Open Channel Flow, Pipe Flow :

Fluid properties; Dimensional Analysis and Modeling; Fluid dynamics including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; Pipe networks.

Hydraulic Machine and Hydro Power -

Various pumps, Air vessels, Hydraulic turbines - types, classifications & performance parameters; Power house - classification and layout, storage, pondage, control of supply.

Hydrology and Water Resources Engineering

Hydrological cycle, Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging; River morphology; Flood. drought and their management; Capacity of Reservoirs.

Water Resources Engineering : Multipurpose uses of Water, River basins and their potential; Irrigation systems, water demand assessment; Resources - storages and their yields; Water logging, canal and drainage design, Gravity dams, falls, weirs Energy dissipaters, barrage Distribution works. Cross drainage works and head-works and their design; Concepts in canal design, construction & maintenance; River training, measurement and analysis of rainfall.

Environmental Engineering

Water Supply Engineering

Sources, Estimation, quality standards and testing of water and their treatment; Rural Institutional and industrial water supply; Physical, chemical and biological characteristics and sources of water. Pollutants in water and its effects, Estimation of water demand; Drinking water Standards, Water Treatment Plants, Water distribution networks.

Waste Water Engineering

Planning & design of domestic waste water, sewage collection and disposal; Plumbing Systems. Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; Industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management.

Solid Waste Management

Sources & classification of solid wastes along with planning & design of its management system; Disposal system. Beneficial aspects of wastes and Utilization by Civil Engineers.

Air, Noise pollution and Ecology

Concepts & general methodology.

Geo-technical Engineering and Foundation Engineering

Geo-technical Engineering : Soil exploration - planning & methods. Properties of soil. classification, various tests and inter-relationships; Permeability & Seepages Compressibility. consolidation and Shearing resistance. Earth pressure theories and stress distribution in soil; Properties and uses of geo-synthetics.

Foundation Engineering: Types of foundations & selection criteria, bearing capacity, settlement analysis, design and testing of shallow & deep foundations; Slope stability analysis. Earthen embankments. Dams and Earth retaining structures: types, analysis and designs, Principles of ground modifications.

Surveying and Geology:

Surveying: Classification of surveys, various methodologies, instruments & analysis of measurement of distances, elevation and directions; Field astronomy. Global Positioning System; Map preparation; Photogrammetry; Remote sensing concepts; Survey Layout for culverts. Canals, bridges. road/railway alignment and buildings. Setting out of Curves-

Geology : Basic knowledge of Engineering geology & its application in projects.

Transportation Engineering

Highways - Planning & construction methodology, Alignment and geometric design; Traffic Surveys and Controls; Principles of- Flexible and Rigid pavements design.

Tunneling - Alignment, methods of construction, disposal of muck, drainage, lighting and ventilation.

Railways Systems - Terminology, Planning. designs and maintenance practices; track modernization.

ELECTRONICS ENGINEERING:

Materials and Components -

Materials and Components are the vertebral column of Electronics and Telecommunication zone. Electronic materials are at the central part of design, expansion of electronic component built-up at the same time electronic components are the empathy of electronic equipment hardware. New-fangled technologies used for trimness of electronic hardware a which are driven by innovations in progression technologies. This includes-

Structure and properties of Electrical Engineering materials; Semiconductors, Conductors, and Insulators, Ferroelectric, magnetic, Piezoelectric, Optical, Ceramic and Super-conducting materials. Passive components and characteristics Capacitors, Resistors and Inductors; Electromagnetic and Electromechanical components, Ferrites, Quartz crystal Ceramic resonators.

Physical Electronics, Electron Device and ICs -

Physical electronics, various electronics devices, ICs form the core of Electronics and Telecommunication branch. This part includes Electrons and holes in semiconductors. Mechanism of current flow in a semiconductor. Carrier Statistics, Hall effect; Different types of diodes and their characteristics; Junction theory; Bipolar Junction transistor; Power switching devices like GTOs, SCRS, power MOSFETS; MOS and CMOS types. Basics of ICs - bipolar; Field effect transistors; basic of Opto Electronics.

Signals and Systems

A Signal is a description of how one parameter varies with another parameter whereas a system is a process that results an output signal when an input signal is given. This section includes Classification of systems and signals; System modelling in terms of differential and difference equations; Fourier series; State variable representation; Fourier transforms and their application to system analysis; Convolution and superposition integrals and their applications; Laplace transforms and their application to system analysis: Z-transforms and their applications to the analysis and characterisation of discrete time systems; Correlation functions, Random signals and probability; Response of linear system to random inputs; Spectral density.

Network theory

A network is a anthology of interrelated components. Analysis of network is the method of finding the currents through, voltages across every module in the network. There are diverse techniques for scheming these values. This includes Network analysis techniques; transient response, Network theorems, steady state sinusoidal response; Tellegen's theorem. Two port networks; Network graphs and their applications in network analyses; Z, Y, h and transmission parameters. Analysis of common two ports. Combination of two ports. Network functions : obtaining a network function from a given part. parts of network functions. Elements of network synthesis. Transmission criteria : Elmore's and other definitions effect of cascading, delay and rise time.

Electromagnets Theory -

The electromagnetic force is considered to be one of the basic interactions in nature. This force is depicted by electromagnetic forces which has immeasurable physical instances along with the interface of particles charged electrically and the interface of uncharged magnetic force fields

This segment includes:- Boundary value problems and their solutions; Laplace's and Poisson's equations; Analysis of magnetostatic and electrostatic fields; Maxwell's equations; Transmission lines : basic theory, matching applications. Standing waves, microstrip lines; Basics of wave guides and resonators; application to wave propagation in unbounded and bounded media; Elements of antenna theory.

Electronic Measurement and Electronic instrumentation

Electronic Instrumentation and Measurements represents a inclusive handling of the operation, Applications, performance and limitations of both analog and digital instruments. This includes Basic concepts, standards and error analysis; Electronic measuring instruments and their principles of working: analog and digital, application, comparison, characteristics. Transducers; Measurements of basic electrical quantities and parameters: basics of telemetry for industrial use: Electronic measurements of non electrical quantities like pressure, temperature, humidity etc .

Analog Electronic Circuits

Analog electronics considered to be systems in electronics with a Continuous inconsistent signal. The word "analogue" describes the relative association amid current or voltage and a signal. This includes:- Transistor biasing and stabilization. Power amplifiers. Frequency response. Small signal analysis. Feedback amplifiers. Wide banding techniques. Tuned amplifiers. Power supplies and Rectifiers. PLL, Op Amp. other linear integrated circuits and applications. Oscillators. Waveform generators and Pulse shaping circuits.

Digital Electronic Circuits -

Digital electronics circuits correspond to signals by distinct bands of analog level. All levels inside a band symbolize the identical signal status. This includes- Transistor as a switching element: Simplification of Boolean functions. Karnaguh map, Boolean algebra, and applications: IC logic families : DTL, ECI, TTL, NMOS, CMOS and PMOS gales and their comparison; Full adder, Half adder; IC Logic gates and their characteristics; Digital comparator; Multiplexer Demulti-plexer; Flip flops. J-K. R-S, T and D flip-flops; Combinational logic Circuits; Different types of registers and counters Waveform generators. Semiconductor memories-A/D and D/A converters. ROM an their applications.

Control Systems -

A control system is said to be a gadget or a lay down of devices that commands, manages, regulates the performance of supplementary systems. In industrial fabrication control systems are used. This includes:- Transient and steady state response of control systems; Root locus techniques; Concepts of gain and phase margins: Constant-N Nichol's Chart and Constant-M ; Effect of feedback on stability and sensitivity; Approximation of transient response from Constant-N Nichol's Chart; Design of Control Systems, Compensators; Approximation of transient response from closed loop frequency response: Industrial controllers. Frequency response analysis.

Communication Systems -

It's a collection of individual communication networks, relay stations, transmission systems and data terminal equipments which are interfaced together to form an integrated system. In communications system its subsystem are said to be a functional assembly of systems. This includes.-

Basic information theory; Sampling and data reconstructions; Modulation and detection in analogue and digital systems; Quantization & coding; Frequency division multiplexing and Time division; Optical Communication : in free space & fiber optic; Equalization; Propagation of signals at VHF, HF, UHF and microwave frequency; Satellite Communication.

Microwave Engineering

Microwave engineering deals with the study and planning of microwave components, circuits and systems. Elementary ideology are applied to design, analyze and measure techniques. This includes:- Microwave Tubes and solid state devices. Waveguides and other Microwave Components and Circuits. Microwave generation and amplifiers, Microstrip circuits, Microwave Measurements. Lasers, Masers. Microwave Antennas; Microwave Communication Systems terrestrial and Satellite based. Microwave propagation.

ELECTRICAL ENGINEERING

General Engineering:

General Engineering, Analog Electronic-I, Electrical Measuring Instruments and Instrumentation, Electrical Engineering Design and Drawing-I.

Basic Electrical Engineering:

Application and Advantages of Electrical Energy, Basic Electrical quantities, Batteries, DC Circuits, Magnetism and Electromagnetism, Electromagnetic induction, AC Fundamentals, Polyphase Systems.

Electrical Engineering:

Electrical Machines-I, Estimating and costing in Electrical Engineering, Electrical Engineering Design and Drawing, computer programming and Applications. Electrical Machines-II, Electrical Power-I, Power Electronics' Digital electronics Microprocessors, Utilization of Electrical Energy. Control of Electrical Machine, Installation and Maintenance of Electrical Machine, Computer Aided Instrumentation, Entrepreneurship Development and Management, PC maintenance and Repair. Basic quantities of Electricity, Basics of Electronics, Various Types of Power plants, Electrical Distribution system, Domestic Installation, Transformers, Electric Motors and Pumps.

Analog Electronics:

Brief history of development of electronics, active and passive components, Concept of current and voltage sources, Semi-conductor theory, Diodes Bi-polar Transistors, Single stage transistor amplifiers, Field Effect transistor (FET). Multi-stage transistor amplifiers, Transistor Audio Power Amplifier, Tuned Voltage amplifier, Sinusoidal Oscillators, Wave shaping and switching circuits, Operational Amplifier.

Electrical and Electronic Engineering Materials:

Classification, Conducting Materials, Applications of special metals, silver, Bronze, Copper, Superconductors and their applications, Electrical Properties.

Electrical Engineering Design and Drawing:

Symbols and signs conventions, simple light and fan circuits, simple alarm circuits with and without relays, design and drawing of panels/distribution. Contractor Control Circuits, Earthing, Drawings of Machine Parts.

Electrical Machines:

DC Machines, Transformers (single phase), Three phase transformers. Synchronous machine, Induction Motors, special purpose machine.

Estimating and Costing in Electrical Engineering:

Type of wiring, Estimating and Costing-domestic installations, industrial installations, estimating the material required for.

Electrical Power:

Transmission systems, Distribution system, substations, faults, power factor, various types of tariffs.

Power Electronics:

Introduction to Thyristors, controlled Rectifiers, Inverters, Choppers, Dual converters and cyclo converters, Thyristor control of electric drives.

Digital electronics Microprocessors:

Number systems, Gates, Boolean Algebra, Combinational Circuits, Flip flops, A/D and D/A converts.

Utilization of Electrical Energy:

Electric Drives, Illumination, Electric Heating, Electric Welding, Electrolytic process. Electrical circuit used in Refrigeration AC and water cooler, Eclectic Traction.

Control of Electrical Machine:

Basic of control systems, loop, closed loop, block diagram, stability, starters for 3 phase squirrel cage induction.

Installation and Maintenance of Electrical Machine:

Installation, laying of underground cables, Maintenance; Computer Aided Instrumentation, Energy Management, Optical Fibre Communication, Micro Controllers and PLCs.

Supply from the poles to the Distribution Board:

Arrangement of supply system from pole to the distribution board Function; Function of service line, energy meter, main switch, distribution board.

Domestic Installation:

Distinction between light & fan circuits and single phase power circuit, sub circuits; Various accessories and parts of installation, identification of wiring systems; Common safety measures and earthing; Introduction to BIS code of safety and wiring installation.

Electric Motors and Pumps: Definition and various application of single phase and three phase monitors; Conversion of horse power in watts or kilowatts; Type of pumps and their application; Use of direct online starter and star della starter.

COMPUTER ENGINEERING (Only for Post of Station Controller/Train Operator (SC/TO))

Hardware and software aspects of computing from design of computer , microprocessors and other circuit designs. This includes- Number Systems. Programming; Data representation; Elements of a high level programming language PASCAL/C; Control unit design; Fundamentals of computer architecture; Processor design; Use of basic data structures; I/o System Organization, Memory organization. Microprocessors : Architecture and instruction set of Microprocessors 8086 and 8085, Assembly language Programming. Personal computers and their typical uses. Microprocessor Based system design : typical examples.starter and star delta starter.

(A) Details of the On-line Examination Pattern

- (1) The examination would be conducted on-line i.e. on a computer.
- (2) Tests of Logical Ability & Reasoning, Quantitative Aptitude, General English, Technical Knowledge will be in English. Test of Gujarati Language will be in Gujarati
- (3) All the questions will have multiple choices. Out of the five answers to a question only one will be the correct answer. **The candidate has to select the most appropriate answer and ‘mouse click’ that alternative which he/ she feels is appropriate/ correct. The alternative/ option that is clicked on will be treated as the answer to that question. Answer to any question will be considered for final evaluation, only when candidates have submitted the answers by clicking on “Save & Next” or “Mark for Review & Next”.**
- (4) The clock has been set at the server and the countdown timer at the top right corner of your screen will display the time remaining for you to complete the exam. When the clock runs out the exam ends by default - you are not required to end or submit your exam.
- (5) The question palette at the right of screen shows one of the following statuses of each of the questions numbered:



You have not visited the question yet.



You have not answered the question.



You have answered the question.



You have NOT answered the question but have marked the question for review.



You have answered the question but marked it for review.

The Marked for Review status simply acts as a reminder that you have set to look at the question again. *If an answer is selected for a question that is Marked for Review, the answer will be considered in the final evaluation.*

- (6) To select a question to answer, you can do one of the following :
 - (a) Click on the question number on the question palette at the right of your screen to go to that numbered question directly. Note that using this option **does NOT save your answer** to the current question.
 - (b) Click on **‘Save & Next’** to save answer to current question and to go to the next question in sequence.
 - (c) Click on **‘Mark for Review and Next’** to save answer to current question, mark it for review, and to go to the next question in sequence.

- (7) To select your answer, click on one of the option buttons.
- (8) To change your answer, click another desired option button.
- (9) To save your answer, you **MUST** click on **Save & Next**.
- (10) To deselect a chosen answer, click on the chosen option again or click on the **Clear Response** button.
- (11) To mark a question for review click on **Mark for Review & Next**. *If an answer is selected for a question that is Marked for Review, the answer will be considered in the final evaluation.*
- (12) To change an answer to a question, first select the question and then click on the new answer option followed by a click on the **Save & Next** button.
- (13) Questions that are saved or marked for review after answering will ONLY be considered for evaluation.**
- (14) Sections will be displayed on the top bar of the screen. Questions in a section can be viewed by clicking on the section name. The section you will view will be highlighted.
- (15) After clicking the **Save & Next** button on the last question for a section, you will automatically be taken to the first question of the next section.
- (16) You can move the mouse cursor over the section names to view the status of the questions for that section.
- (17) You can shuffle between questions of respective sections during the examination as per the time allotted to Part 1 and Part 2.
- (18) The candidates are requested to follow the instructions of the "Test Administrator" carefully. If any candidate does not follow the instructions / rules, it would be treated as a case of misconduct/ adoption of unfair means and such a candidate would be liable for debarment from appearing for examinations for a period as decided by MEGA.
- (19) The candidates may ask the Test Administrator about their doubts or questions only before the commencement of the test. No query shall be entertained after the commencement of the examination.
- (20) After the expiry of test duration, the candidates will not be able to attempt any question or check their answers. The answers of the candidate would be saved automatically by the computer system even if he/ she has not clicked the "Submit" button.
- (21) Please note :**
 - (a) Candidates will not be allowed to "finally submit" unless they have exhausted the actual test time.**
 - (b) Under no circumstances should a candidate click on any of the 'keyboard keys' once the exam starts as this will lock the exam.**

B] General Instructions:

- (1) Please note date, time and venue address of the examination given in the call letter.
- (2) You may visit the venue one day before the Online Examination to confirm the location so that you are able to report **on time** (as printed on the call letter) on the day of the examination. Late comers will not be allowed.
- (3) The call letter should be brought with you to the examination venue along with your recent passport size photograph duly pasted on it. (Preferably the same photograph as was as uploaded).
- (4) You must scrupulously follow the instructions of the Test Administrator and MEGA Representative at the examination venue. If you violate the instructions you will be disqualified and will be asked to leave the examination venue.
- (5) No use of calculators (separate or with watch), books, note books or written notes, cell phones (with or without camera facility), or any other electronic device will be allowed during the examination.

- (6) Please bring the call letter with your photograph affixed thereon, currently valid Photo identity proof in original and a photocopy of the same ID proof which you bring in original - THIS IS ESSENTIAL. Please hand over the call-letter alongwith photocopy of photo identity proof duly stapled together to the invigilator. Currently valid photo identity proof may be PAN Card/Passport/Driving Licence/Voter's Card/Bank Passbook with photograph/Photo Identity proof issued by a Gazetted Officer on official letterhead /Photo Identity proof issued by a People's Representative on official letterhead/ Valid recent Identity Card issued by a recognised College/University/Aadhar/E-Aadhar Card with a photograph/Employee ID/Bar Council Identity card with photograph. **Please Note - Ration Card will NOT be accepted as valid ID proof for this project.** Please note that your name as appearing on the call letter (provided by you during the process of registration) should exactly match the name as appearing on the photo identity proof. Female candidates who have changed first/last/middle name post marriage must take special note of this. If there is any mismatch between the name indicated in the Call Letter and Photo Identity Proof you will not be allowed to appear for the exam. In case of candidates who have changed their name will be allowed only if they produce Gazette notification/their marriage certificate/affidavit.
- (7) Your responses (answers) will be analysed with other candidates to detect patterns of similarity of right and wrong answers. If in the analytical procedure adopted in this regard, it is inferred/ concluded that the responses have been shared and scores obtained are not genuine/valid, your candidature may be cancelled. Any candidate who is found copying or receiving or giving assistance or engaging in any behaviour unbecoming of a candidate will not be considered for assessment. The MEGA may take further action against such candidates as deemed fit by it.
- (8) You should bring with you a ball-point pen. A sheet of paper will be provided which can be used for rough work or taking down the question number you would like to review at the end of the test before submitting your answers. After the test is over you MUST hand over this sheet of paper to the Test Administrator before leaving the venue.
- (9) The possibility of occurrence of some problem in the administration of the examination cannot be ruled out completely which may impact test delivery and/or result from being generated. In that event, every effort will be made to rectify such problem, which may include movement of candidates, delay in test. Conduct of a re-exam is at the absolute discretion of test conducting body. Candidates will not have any claim for a re-test. Candidates not willing to move or not willing to participate in the delayed process of test delivery shall be summarily rejected from the process.
- (10) If the examination is held in more than one session, the scores across various sessions will be equated to adjust for slight differences in difficulty level of different test batteries used across sessions. More than one session are required if the nodes capacity is less or some technical disruption takes place at any centre or for any candidate.
- (11) Anyone found to be disclosing, publishing, reproducing, transmitting, storing or facilitating transmission and storage of test contents in any form or any information therein in whole or part thereof or by any means verbal or written, electronic or mechanical or taking away the papers supplied in the examination hall or found to be in unauthorised possession of test content is likely to be prosecuted.
- (12) Instances for providing incorrect information and/or process violation by a candidate detected at any stage of the selection process will lead to disqualification of the candidate from the selection process and he/she will not be allowed to appear in any recruitment process of the MEGA in the future. If such instances go undetected during the current selection process but are detected subsequently, such disqualification will take place with retrospective affect.

IMPORTANT POINTS TO REMEMBER

You are advised to bring with you the following:

- (i) Call letter with photo affixed thereon and photo ID card in **Original** and photocopy as mentioned in point 6 above.
- (ii) One Ball point pen.

WISH YOU GOOD LUCK