Pattern of examination for Post No.5 to Post No.20 (Technical Post):

1. Total 100 MCQ type questions with no negative marking.
2. Candidate can choose the medium for the examination i.e., Hindi or English.
3. Examination would be for two hours.
4. Weightage will be given as follows :

Topics	Weightage (%)
Topics related to history of Indian Institute of Geomagnetism (IIG), Research carried out at IIG, general science, general aptitude, basic mathematics and statistics and general knowledge.	25%
Topics related to the core subjects mentioned in the essential and desirable qualifications for the respective positions.	75%

Note: The following syllabus is indicative and the questions in the test may include similar other topics pertaining to the level and content of essential qualification.

Syllabus for written examination

Common syllabus for all posts:

About IIG, IIG's research activities, solar system, Sun's atmosphere, Earth's Atmosphere, Geomagnetism, Magnetic observatories in India, Magnetic materials, interior of the Earth, Kepler's law, Gravitation, Conics, binomial theorem, probability, statistics, series, sets, straight lines, general aptitude, logical reasoning, Indian space missions etc.

Posts no.	Pay Band	Essential Qualification	Desirable qualification	Syllabus for Examination
Post no. 5	Level 7 [TO-I, EWS]	MSc. Geophysics with 2 years of experience	Knowledge and experience in modelling of Geophysical phenomena of solid earth/ionosphere/magnetosphere	Earth and planetary system; Atmosphere, Ionosphere and Magnetosphere; Physical Geology- Elementary Petrology and Structural Geology, Geological Time scale, Plate-tectonics etc.; Basic geological & tectonic features & geodynamics of Indian sub-continent & adjoining oceans; Mineral, coal and petroleum resources of India; Elements of Hydrogeology; Geothermics and heat flow; Geophysical Surveys; Principles, Instrumentation, modelling and applications of - gravity, magnetic, electrical, electromagnetic, seismic and radiometric methods for prospecting for oil, mineral, ground water etc.; Introductory well logging and remote sensing; Solid Earth Geophysics – gravity field of the earth, size & shape of the earth, geomagnetic field, palaeomagnetism, seismology and interior of the earth;, variation of density, velocity, pressure, temperature, electrical and magnetic properties of the earth, sea floor spreading; gravity and magnetic anomalies of ocean floors and their significance; Geophysical Signal Processing and Inversion; Elementary geo-mathematics;

Posts no.	Pay Band	Essential Qualification	Desirable qualification	Syllabus for Examination
Post no. 6	Level 7 [TO-I, ST]	B.E/B.Tech in Electronics/ Computer/Digital Communication. **2 years' experience** Master's/ ME/M.Tech degree in Electronics / Computer / Digital Communication	Experience in design and development of analog and digital systems / FPGA/ ARM based processors	Fundamentals of Electricity and Electronics, Ohm's law, Kirchhoff law, resistor, inductor, capacitor, diode, and transistor.
				Fundamentals of DC and AC circuit theory, current, voltage, energy, and power. Node and mesh analysis, superposition, Thevenin's theorem,
				Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer.
				Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform, Linear 2-port network parameters Fourier series and Fourier transform, sampling theorem and application.
				Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, semiconductors. Diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, continuity equations. P-N junction, Zener diode, BJT, FET, MOSFET, LED, photo diode and solar cell. Diode circuits, Clipping and clamping, Rectifiers. Digital electronics, binary, integer and floating-point-numbers.
				Fundamentals of Boolean algebra, Combinatorial circuits and sequential circuits, minimization of functions using Boolean identities and Karnaugh map, logic gates, latches and flip-flops, counters, shift-registers. Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis,
				Information theory, entropy, mutual information and channel capacity theorem, EM theory, Maxwell's equations, wave equation, Poynting vector, reflection, refraction, polarization, phase and group velocity, skin depth, transmission line characteristics impedance, S-parameters, waveguides, T-Junctions, E-plane T junction, HPlane T junctions, dipole and monopole antennas, linear antenna arrays.
				Communication systems, modulation, and demodulation. Digital Signal processing, Embedded systems, radar, RF devices and applications, Lithography, Wireless networks, and internet of things.

Posts no.	Pay Band	Essential Qualification	Desirable qualification	Syllabus for Examination
Post no. 7 [TO-I, UR]	Level 7	B.E/B.Tech in Civil Engineering with 2yrs experience	Knowledge in tendering, contract, CPWD, DSR, schedule, concept and workable design in CAD, CAM, BOQs, various construction tests and quality parameters, Government norms and procedures for civil works, Bill processing / M Book, MEP etc.	Building Construction and materials, transportation engineering, geotechnical engineering, water resources engineering, environmental engineering, construction management, strength of materials, structural analysis, steel and RCC structures, fluid mechanics, surveying, engineering geology, engineering hydrology.
Post no. 8 [STA, EWS]	Level 6	M. Sc. Physics	Observation and analysis of atmosphereIonosphere system	**Physics:** Electrodynamics: Maxwell's equations, The Poynting vector, Maxwellian stress tensor, Lorentz Transformations, Electromagnetic waves in vacuum, Polarization of plane waves. Electromagnetic waves in matter, Polarization, Phase Velocity, Group Velocity, Cutoffs, Resonance for Electromagnetic Wave, waveguides Mathematical Physics: Fourier series, Fourier integrals, Fourier Transform, Laplace transforms, Laplace transform Inverse Laplace transform convolution theorem. Matrices, Eigenvalues and Eigen vectors, Complex Algebra, Limits, Continuity, Derivatives, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, Elementary functions: Exponential and Trigonometric, Taylor and Laurent series, Differential Equations: Series solutions, Legendre, Hermite and Laguerre polynomials, Bessel equations, Partial differential equations, separation of variables, wave equation, Green's functions in one dimension. Semiconductor physics: Classification of Semiconductors; Crystal structure with examples of Si, Ge and GaAs semiconductors; Energy band structure of Si, Ge and GaAs; Extrinsic and compensated Semiconductors; Temperature dependence of Fermi-energy and carrier concentration. p-n junction, Metal-semiconductor field effect transistor (MESFET), JK Flip-Flop and up-down counter

				Thermodynamics of blackbody radiation, Thermodynamic behavior of an ideal Fermi gas, concept of Fermi energy, behaviour of specific heat with temperature. Alpha decay, Beta decay and its energetic, Fermi theory, Half life time. Kinetic theory of gases, Maxwellian behavior, Newtons law of cooling
				Basics of Statistical Mechanics: Canonical and Grand-canonical ensembles, Partition functions, Density correlation functions, Thermodynamic functions, Fluctuations, Equivalence of ensembles, Ideal Bose and Fermi gas.
				Earth's Atmosphere-Ionosphere system, Earth's biosphere, atmospheric waves, solar radiation, atmospheric neutral/thermal structures, Ionospheric currents, observational techniques and their principles for ionosphere.
Post no. 9	Level 6 [STA, OBC]	BE/ME computer Engineering	2 years' experience of working in a reputed Research Laboratory/Institute/University with:- (i) Good practical knowledge in Computer Programming (ii) Working knowledge of Web Technology/Web development tool, skill on ASP/VB Script (iii) Preference would be given to candidates having prior relevant experience in Linux System administration	Data structure, Discrete Structures, Computer Networks, Programming in C/C++, Python Programming, Web Technology (HTML, pHP, SQL, Javascript/VSscript) Linux Administration, Operating System, Relational Database Management system, Software Engineering. Compiler Design, Theory of Computation, Computer Architecture.
Post no. 10:	Level 6 [STA, OBC]	M. Sc. Physics/Electronics/Computer Science 3 years' experience of working in the above in a reputed Research	2 years' experience of working in observation and analysis data and network in a reputed Research Laboratory / Institute / University	**Physics:** Electrodynamics: Maxwell's equations, The Poynting vector, Maxwellian stress tensor, Lorentz Transformations, Electromagnetic waves in vacuum, Polarization of plane waves. Electromagnetic waves in matter, Polarization, Phase Velocity, Group Velocity, Cutoffs, Resonance for Electromagnetic Wave, wave guides. Mathematical Physics: Fourier series, Fourier integrals, Fourier Transform, Laplace transforms, Laplace transform Inverse Laplace transform

		Laboratory / Institute / University		convolution theorem. Matrices, Eigenvalues and Eigen vectors, Complex Algebra, Limits, Continuity, Derivatives, Cauchy-Riemann Equations, Analytic functions, Harmonic functions, Elementary functions: Exponential and Trigonometric, Taylor and Laurent series,
				Differential Equations: Series solutions, Legendre, Hermite and Laguerre polynomials, Bessel equations, Partial differential equations, separation of variables, wave equation, Green's functions in one dimension.
				Semiconductor physics: Classification of Semiconductors; Crystal structure with examples of Si, Ge and GaAs semiconductors; Energy band structure of Si, Ge and GaAs; Extrinsic and compensated Semiconductors; Temperature dependence of Fermi-energy and carrier concentration. p-n junction, Metal-semiconductor field effect transistor (MESFET), JK Flip-Flop and up-down counter
				Thermodynamics of blackbody radiation, Thermodynamic behavior of an ideal Fermi gas, concept of Fermi energy, behaviour of specific heat with temperature. Alpha decay, Beta decay and its energetic, Fermi theory, Half life time. Kinetic theory of gases, Maxwellian behavior, Newtons law of cooling
				Basics of Statistical Mechanics: Canonical and Grand-canonical ensembles, Partition functions, Density correlation functions, Thermodynamic functions, Fluctuations, Equivalence of ensembles, Ideal Bose and Fermi gas.
				Electronics and Computer Science
				Operational Amplifier, Instrumentation Amplifier using IC, Precision Rectifier, Voltage to Current
				Converter, Current to Voltage Converter, OpAmp Based Butterworth Higher Order Active Filters and Multiple Feedback Filters
				Data structure, Operating system, Programming Using C/C++: Introduction to Computers and programming Computer Architecture, Computer Network; Digital logic, circuit, Basic electronics (Transistor, Diode etc.).
				Microprocessors: Introduction to Microprocessors, Organization of Microprocessors, Signal
				Description of Microprocessors, Instruction Sets, Programming Techniques with Additional
				Instructions, Counters and Time Delays, Stack and

				Sub-routines, Physical Memory Organization, Bus Operation, I/O Addressing Capability, Application of Microprocessors. (b) Microcontrollers: Introduction to Microcontrollers, Embedded versus External Memory Devices, 8–bit and 16–bit Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Commercial Microcontroller Devices. Power Supplies, Linear Power supply. Programming Using C/C++: Introduction to Computers and programming
Post no. 11 Post no. 15	Level 6 [STA, 1-SC, 1-UR]	M.Sc. in Geophysics	Ability to handle Geophysical instruments/ Data and Knowledge of Survey	Earth and planetary system; Atmosphere, Ionosphere and Magnetosphere; Physical Geology- Elementary Petrology and Structural Geology, Geological Time scale, Plate-tectonics etc.; Basic geological & tectonic features & geodynamics of Indian sub-continent & adjoining oceans; Mineral, coal and petroleum resources of India; Elements of Hydrogeology; Geothermics and heat flow; Geophysical Surveys; Principles, Instrumentation, modelling and applications of - gravity, magnetic, electrical, electromagnetic, seismic and radiometric methods for prospecting for oil, mineral, ground water etc.; Introductory well logging and remote sensing; Solid Earth Geophysics – gravity field of the earth, size & shape of the earth, geomagnetic field, palaeomagnetism, seismology and interior of the earth;, variation of density, velocity, pressure, temperature, electrical and magnetic properties of the earth, sea floor spreading; gravity and magnetic anomalies of ocean floors and their significance; Geophysical Signal Processing and Inversion; Elementary geo-mathematics.
Post no. 12	Level 6 [STA, SC]	M.Sc. in Geology	Knowledge of field surveys and basic understanding in the above relevant subject	Physical Geology: Principle of uniformitarianism; origin, differentiation and internal structure of the Earth; origin of atmosphere; earthquakes and volcanoes; continental drift, sea-floor spreading, isostasy, orogeny and plate tectonics; erosional and depositional landforms; weathering processes and products. Structural Geology: Stress, strain and rheological properties of rocks; planar and linear structures; classification of folds and faults; ductile and brittle shear in rocks; study of toposheets; stereographic projections of structural elements. Mineralogy: Elements of symmetry, notations and indices; Bravais lattices; chemical classification of minerals; isomorphism, polymorphism, solid

					solution and exsolution; silicate structures; physical and optical properties of common rockforming minerals. Igneous Petrology: Magma types and their evolution; IUGS classification of igneous rocks; forms, structures and textures of igneous rocks; applications of binary and ternary phase diagrams in petrogenesis; magmatic differentiation and assimilation; petrogenesis of granites and basalts. Metamorphic Petrology: Limits, types and controls of metamorphism; metamorphic structures- slate, schist and gneiss; metamorphic textures- pre, syn and post tectonic porphyroblasts; concept of the metamorphic zone, isograd and facies. Sedimentology: Origin of sediments; sedimentary textures, grain-size scale; primary sedimentary structures; classification of sandstone and carbonate rocks; siliciclastic depositional environments and sedimentary facies; diagenesis of carbonate sediments. Paleontology: Fossils and processes of fossilization; concept of species and binomial nomenclature; morphology and classification of invertebrates; microfossils-Foraminifera. Stratigraphy: Law of superposition; stratigraphic nomenclature- lithostratigraphy, biostratigraphy, magnetostratigraphy and chronostratigraphy; Archaean cratonic nucleii of Peninsular India; Proterozoic mobile belts; Purana sedimentary basins, Phanerozoic stratigraphy of India. Economic Geology: Properties of mineral deposits- form, mineral assemblage, texture, rock-ore association and relationship; magmatic, sedimentary, metamorphic, hydrothermal, supergene and weathering- related processes of ore formation; distribution and geological characteristics of major mineral and hydrocarbon deposits of India. Geodynamics: Phase transitions and seismic discontinuities in the Earth; seismic and petrological Moho; rheology of rocks and fluids; rock magnetism; palaeomagnetism and polarity reversals, polar wandering and supercontinent cycles; continental drift, sea floor spreading; gravity and magnetic anomalies of ocean floors and their significance; mantle plumes and their origin; plate tectonics- types of plate boundaries and their inter-relationship

				Geochemistry and isotope geology: Chemical composition and characteristics of atmosphere, lithosphere, hydrosphere; geochemical cycles; meteorites-types and composition. Half-life and decay equation; dating of minerals and rocks with potassium-argon, and uranium-lead isotopes; stable isotope geochemistry of carbon, oxygen and sulphur and their applications in geology. Field Geology: Field mapping, strike and dip measurements, identification of folds and faults, litholog preparations.
Post no.13	Level 6 [STA, UR]	M.Sc. Electronics	Knowledge of design and development of analog and digital systems/ programming, Operating knowledge of Lab instruments such as oscilloscope, multimeters, function generators etc.	Semiconductor devices, Network Analyzer, Digital Circuit Design, Analog current Design, Signal and subsystems, Electromagnetic antenna and Propagation, Control and Instrumentation Introduction to control system, open loop and closed loop control system, system sensitivities, error amplifier, on-off controller, Characteristics of instruments and measuring systems, errors in measurements, dynamic characteristics of instruments and measurement systems, galvanometers, ammeter, voltmeter, potentiometers, AC bridges, watt meter, optoelectronic measurements. Oscilloscopes: CRT, CRO, storage and digital storage oscilloscope. Wave analyzer and spectrum analyzer. Transducers. Interfacing: RS 232 serial, parallel. Semiconductor Nanostructures and Characterization, Junction Diodes, Bipolar Junction Transistors, Field Effect Transistors: JFET, construction, working principle, I-V characteristics, small signal equivalent circuit of JFET, MOS devices, concept of depletion and inversion in MOS capacitor, MOSFET, construction, working principle, characteristics, depletion and enhancement type, introduction to CMOS.
Post no.14	Level 6 [STA, UR]	M.Sc. in Pure Mathematics OR Applied Mathematics	Ability to estimate and handle data	Statistics and probability, Optimization, Linear algebra, Real analysis, Functional Analysis, Complex Analysis, Fourier series, Fourier transform, Laplace transform, first and second order differential equation, Gamma function, complex numbers, determinants, trigonometry, vector algebra; Differential and Integral Calculus; Number theory; Modern Algebra.
Post no. 16	Level 5	B. Lib Science	Proficiency in computer, Microsoft	Library and Society; Library Classification and Cataloguing; ICT Basics and Applications in

			office, Library software, KOHA, OSS etc.	Libraries; Library organization and management; Information Sources and Information Products; Library and Information Services.
Post No. 17 [TA, EWS]	Level 5 [TA, EWS]	B.Sc. Physics/Electronics or computer (Basic knowledge)		**Physics** Electrostatics, Magnetostatics, dielectrics, Maxwell's equation, Electromagnetic wave, Laws of motion, Static friction, kinetic friction, Units and dimensions, kinetic theory of gases, Concepts of work, energy, power, Rotational motions, wave propagation, fluid dynamics, mechanical properties of solids, interference, diffraction, reflection, refraction, scattering, Zeeman effect. Fourier series, Fourier transform, Laplace transform, first and second order differential equation, Gamma function, complex numbers, determinants, trigonometry, vector algebra **Electronics and Computers** Basics: Semiconductors, p-type, n-type, Transistors, diodes, transistor biasing, doping methods, Resistance in series, resistance in parallel, power supply, energy and power, electrolysis and battery functioning, electrical machines design, AC motors, DC motors, resistors. Field effect transistors: JFET: Basic ideas, Drain curve, The trans-conductance curve, Biasing in the ohmic region and the active region, Transconductance etc. MOSFET: Depletion and enhancement mode, MOSFET operation and characteristics, digital switching. SCR – construction, static characteristics, Analysis of the operation of SCR, Gate Triggering Characteristics, Variable half wave rectifier and Variable full wave rectifier, Current ratings of SCR, Differential Amplifier using transistor Logic families: Standard TTL NAND, TTL NOR, Open collector gates, Three state TTL devices, MOS inverters, CMOS NAND and NOR gates, CMOS characteristics. Digital Communication Techniques: Digital Transmission of Data, Benefits of Digital Communication, Disadvantages of Digital Communication, Parallel and Serial Transmission. Amplitude/phase/frequency modulation, satellite communication, digital signal processing. Data structure (Array, list, stack queue, Binary Tree), Operating systems (memory management, CPU scheduling, Process Management); Basics of C/C++ Programming, Basics of Python Programming.

Posts no.	Pay Band	Essential Qualification	Desirable qualification	Syllabus for Examination
Post no. 18	Level 5 [TA, UR]	Diploma in Civil Engineering	Experience in development or operation or maintenance of Govt. or similar infrastructure and more (see advertisement)	Construction and materials, Concrete Technology, transportation engineering, water resources engineering, environmental engineering, construction management, strength of materials, structural analysis, steel and RCC structures, fluid mechanics, surveying, engineering geology, engineering hydrology
Post no. 19	Level 5 [TA, UR]	B Sc. Computer Science	Ability to handle data and manage auto network.	Data structure, Discrete Mathematics, Fundamental of Computer Network, TCP/IP protocol Operating systems, Object Oriented Concepts, C/C++ Programming, RDBMS, Python Programming; Basics of Windows and Linux Operating systems, Software Engineering.
Post no. 20	Level 5 [TA, UR]	B.Sc in Electronics or Instrumentation	Knowledge of above relevant fields	Fundamentals of Electricity and Electronics, Ohm's law, Kirchhoff law, resistor, inductor, capacitor, diode, and transistor. Fundamentals of DC and AC circuit theory, current, voltage, energy, and power; Circuit Analysis, Electronic Devices, Analog circuits, Linear integrated circuits, Digital communication, Electronic Instrumentation, Microprocessor and Applications, Microcontroller and Applications, Optical Fiber communication, Semiconductor Devices and Applications, Analogue Communication, Numerical Analysis and Programming in C, VLSI and Embedded System, Embedded Networking, Advanced Microprocessor, Embedded System Design using PIC Microcontroller.