Syllabus for the post of Senior Technical Assistant (Geophysics)

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GENERAL KNOWLEDGE / AWARENESS (10 Q)


MATHEMATICAL ABILITY (10 Q)

Number system, Simplification, HCF & LCM, Percentage, Average, Ratio & Proportion, Profit & Loss, Partnership, Time and Work, Time and Distance, Permutations & Combinations, Probability.

MENTAL ABILITY / REASONING (10 Q)

Reasoning Ability: Analogy / Analogous Problems, Classification, Word formation, Ranking / Arrangement, Series, Coding & Decoding, Distance and Direction, Symbol & Notation, Scheduled Day or Date, problem based on Ages and Calendar, Data Interpretation.

LANGUAGE PROFICIENCY (ENGLISH 10 Q, PUNJABI 10 Q)

General English up to 10+2 standard
General Punjabi up to 10th standard

PROFESSIONAL (50 Q)

**Solid Earth Geophysics:** Earth: its rotation and figure. Gravity and its variation over the earth, Earth: surface features, continents, continental margins, oceans. Thermal history and its characteristics over various earth surface features. Earth’s interior: physics status; variation of physical quantities and seismic wave velocity inside the earth, major sub divisions. Composition and structure of upper and lower continental crust, layering in oceanic crust, crustal structure studies for mountains, plateau, basins in India, Gravity and DSS studies for the Himalayas. Oceanic magnetic anomalies and their interpretations, magneto stratigraphic time scale, paleomagnetic evidences from continental drift, APWP for different continents-their main results, seismological evidences for lithospheric deformation, concept of sea floor spreading and plate
tectonics, plate margins and processes at plate margins, triple junction, Characteristic movement of Indian plate and formation of the Himalayas.

**Signal Analysis:** Signals, noise and their classification, continuous and discrete signals. Complex exponential Fourier series, Fourier integral, Fourier transform and its properties, energy and phase spectra, Fourier transforms of some commonly used functions, utility of domain transformation; inverse Fourier transform; use of one and two dimensional Fourier transforms in solving geophysical problems, radial and angular spectra.


**Resistivity and IP methods:** Fundamental relation between potential, apparent resistivity, transform and layer distribution of a stratified earth. Applications of linear filter theory; determination of filter coefficients, sinc response- filter length. Potential due to a point source in an anisotropic medium, triangle of anisotropy. Partial curve matching of three layer and four layer curves, Dar Zarrouk parameters, principle of equivalence, Resistivity modeling. Mise-a-la-masse method. Sources of IP, membrane and electrode polarizations, time domain and frequency domain measurement of IP, chargeability, percent frequency effect and metal factors, apparent chargeability over layered earth, electromagnetic coupling.

**Electromagnetic Method:** Principle of electromagnetic induction; magnetic field due to a current carrying loop, elliptical polarization, plane of polarization, dip and tilt angles, nomograms for quantitative determination of parameters by dip angle method, VLF and AFMAG methods TURAM method. Response of a single closed conducting circuit by using a fixed horizontal transmitter-receiver system. Analysis of response function with frequency and different ranges of conductivities, amplitude and phase relations, vector diagrams and their significance. Maxwell’s equations, propagation of electrical and magnetic field as a dissipative wave, diffusion equation, propagation constant.

**Gravity and Magnetic method:** A review of land gravimetry; gravity measurements in sea, reduction of data and interpretation of Bouger anomaly maps; ambiguity in gravity interpretation
and conditions for unique interpretation; use of gravity survey in mineral and hydrocarbon exploration programs, search for metallic and nonmetallic ores, coal and lignite; mapping faults, exploring for salt domes, stratigraphic traps, uplifted horst and graben, use of gravity in regional geological studies including granitic plutons, thrust belts, accreted terrains. Measurement of earth’s magnetic field and its gradient from air and sea, instrument mounting and stability of platforms, reduction of data, preparation and interpretation of anomaly maps, Interpretation of aeromagnetic maps.

**Remote Sensing and Image Processing:** Sources of EMR and governing laws; interaction of EMR with atmosphere and surface of the earth. Atmospheric windows; spectral signature and spectral reflectance, spectral responses of vegetation, water, soil etc. Types of sensors-photographic, single and multi bandopto mechanical, thermal sensors, LISS and sensor array: their principle and operations; spectro-radiometers, microwave sensors: SLAR and SAR Systems. Structure of Remote Sensing Images, Data format BIL, BSQ and BIP, type of data products. Image Processing technique as applied to satellite image data. Image restoration, reduction, magnification, contrast enhancement (linear and non linear), histogram equalization, rationing, filtering and edge enhancement.

**Well logging:** Borehole environment, Logging tools: Basic principles, calibration, environment corrections, computation of reservoir parameters and their simple applications: Resistivity: focused (SFL), micro resistivity devices, conventional induction logging tools. Self potential: electrical analogue of SP, effects of bed thickness, hole diameter, shaliness, irregular invasion on SP response. SP in tight formations, bimetalism and bimagnetism effects on SP. Natural gamma ray: Effects of borehole environment, logging speed, time constant and formation density on log response, corrections for caving and casing etc.; measurement of porosity using neutron sources: CNL SNP; compensated density and sonic tools for porosity measurements.