KOLKATA PORT TRUST

On-line Examination - Recruitment of Executive Engineer (Civil Engineering), Executive Engineer (Electrical Engineering), Executive Engineer (Electronics & Electrical Engineering), Executive Engineer (Electronics & Communication Engineering), Executive Engineer (Electronics & Telecommunication Engineering), Executive Engineer (Mechanical Engineering), Senior Scientific Officer (Hydraulic(phy)), Executive Engineer (Hydraulic(CS)) & Executive Engineer (Hydraulic(IT)), Executive Engineer Hydraulics (Electronics & Communication Engineering), Executive Engineer Hydraulics (Electrical Engineering), Executive Engineer Hydraulics (Electronics and instrumentation), Executive Engineer Hydraulics (Electronics and Telecommunication), Executive Engineer Hydraulics (Electronics and Electrical Engineering), Executive Engineer Hydraulics (Civil Engineering), Executive Engineer Hydraulics (Instrumentation Technology)

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 Question	Marks	Time
1.	Subject Knowledge	40	160	60 Minutes

The time for the test is 60 minutes; however you may have to be at the venue for approximately 90 minutes including the time required for logging in, collection of the call letters, going through the instructions etc. All tests will be provided in English. You can attempt any question at any point of time within these 60 minutes. 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. Each Question caries 4 marks. There will be penalty for wrong answers marked by you. For every wrong answer marked by you, 1 mark will be deducted as penalty.**

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.

SUBJECT KNOWLEDGE

CIVIL ENGINEERING

1. **Building Materials** : Stone, Lime, Glass, Plastics, Steel, Aluminium, Fly Ash, Admixtures, Timbers, Aggregates\Classification, Properties and selection criteria

   Cement : Type, composition, property, uses, specifications and various tests.

   Lime Mortar, Cement Mortar and concrete : Properties, various tests.

   Design of concrete Mixes : Proportioning of aggregates and methods of Mix design.

2. **Solid Mechanics** : Elastic constants, Stress, Strains, theories of failure, bending, shear and torsion.

3. **Structural Analysis** : Basic strength of materials, Type of Stress and strains, Bending moments and shear force, Analysis of determinate and indeterminate structures, Trusses, beams, plane frames ,rolling loads, Influence lines, Unit load and other methods, free and forced vibrations of single & multi degree freedom system, Suspended cables , Concepts and use of Computer aided designs.

4. **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, Earth Quake resistant design of structures, Design of Masonry Structures.

5. **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, Principle of Ultimate load designs.

6. **Construction Practice, Planning and Management :** Construction planning, Equipments, Site investigation and Management including estimations with latest project management tools and network analysis for different type of works, Analysis of rates of various type of works, tendering process and Contract Management, Quality Control, Productivity, Operational cost, Land Acquisition, Labour safety and welfare.

7. **Transportation Engineering :** Roads Planning & construction methodology, Alignment and geometric design, Traffic surveys and controls, Principles of Flexible and Rigid pavement design.

   Railways Systems Terminology, Planning, design and maintenance practices, Track modernisation. Harbours Terminology, Layouts and planning.

8. **Surveying :** Classification of surveys, various methodologies, instruments and analysis of measurement of distances, elevation and directions Global Positioning systems, Map preparations, Survey Layout for culverts, bridges, drains, road/railway alignments and building, setting out of Curves.

9. **Geo- technical and Foundation Engineering :** Type of Foundations and selection criteria, bearing capacity, Settlement analysis, design, and testing of shallow and deep foundations, slope stability analysis, Earthen embankments, Earth retaining structures-Types-analysis-design.

   Properties of soil, classification, various tests and inter-relationships, Permeability and seepage, compressibility, consolidation and shearing resistance, Earth pressure theories and stress distributions in soil, Property and uses of geo-synthetics.

10. **Water supply and wastewater and Solid waste Management Engineering :** Sources, Estimation, quality standards and testing of water and their treatment, Physical, Chemical and biological characteristics of water, Pollutant in water and its effects, Estimation of Water demand, Drinking water standards, Water treatment Plants, Water distribution networks

    Planning and design of domestic waste water, sewage collection and disposal, Plumbing Systems. Components and layout of sewerage system etc.

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

11. **Fluid Mechanics, Open Channel Flow, Pipe Flow :** Fluid properties, Dimensional Analysis and modelling, 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.

ELECTRICAL ENGINEERING

1. **Electric Circuits**

   Network graph, KCL, KVL, Node and Mesh analysis, Transient response of dc and ac networks. Sinusoidal steady-state analysis, Resonance. Passive filters, Ideol current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Two-port networks. Three phase circuits, Power and power factor in ac circuits.

2. **Electromagnetic Fields**

   Coulomb's Law, Electric Field Intensity, Electric Flux Density. Gauss's Law. Divergence, Electric field and potential due to point, line, plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magnetomotive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

3. **Signals and Systems**

   Representation of continuous and discrete-time signals, shifting and scaling operations, Linear Time Invariant and Causal systems, Fourier series representation of continuous periodic signals, Sampling theorem, Applications of Fourier Transform, Laplace Transform and z-Transform.

4. **Electrical Machines**

   Single phase transformer : equivalent circuit, phasor diagram, open circuit and short circuit tests. regulation and efficiency; Three phase transformers : connections, parallel operation; Auto-transformer, Electromechanical energy conversion principles, DC machines: separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors: principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, Starting and speed control; Operating principle of single phase induction, motors; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

5. **Power Systems**

   Power generation concepts, ac and dc transmission concepts, Models and performance of transmission lines ond cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss-seidel and Newton-Raphson load flow methods, Voltage and frequence control, Power factor correction, Symmetrical components. Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concept, Equal area criterion.

6. **Control Systems**

   Mathematical modeling and representation of systems, Feedback principle, transfer function, Block diagrams and Signal flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots, Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PI and PID controllers; State space model, State transition matrix.

7. **Electrical and Electronic Measurements**

   Bridges and Potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

8. **Analog and digital Electronics**

   Characteristics of diodes, BJT, MOSFET; Simple diode circuits : clipping, clamping, rectifiers; Amplifiers: Biasing, Equivalent circuit and Frequency response; Oscillators and Feedback amplifiers; Operational amplifiers: Characteristics and applications; Simple active filters, VCOs and Timers, Combinational and Sequential logic circuits, Multiplexer, Demultiplexer, Schmitt trigger, Sample and hold circuits, A/D and D/A converters, 8085Microprocessor: Architecture, Programming and Interfacing.

9. Power Electronics

Characteristics of semiconductor power devices: Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion: Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of oac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation.

ELECTRONICS & COMMUNICATION

10. Networks, Signals and Systems

Network solution methods : nodal and mesh analysis; Netword theorems : superposition,, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear cicuits; Solution of network equations using Laplace tranform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters : driving point and transfer functions; State equations for networks.

Continuous-time signals : Furier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals : discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems : definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequesncy response, group delay, phase delay, digital filter design techniques.

11. Electronic Devices

Energy bands in intrinsic and extrinsic silicon; Carrier transport : diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equation; P-N junction, Zener diode, BJT, MOS capacitor,MOSFET, LED, photo diode and solar cell; Integrated circuit fabrication process : oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

12. Analog Circuits

Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; single-stage BJT and MOSFF amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback, power and operational; simple op-amp circuits; Active filters; Sinusoidal oscilators :criterion for oscillation, single-transistor and op-amp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation.

13. Digital Circuits

Numbers systems; Combinotrial circuits: Boolean algebra, minimization of functions using Boolean identities and kamaugh map, logic gates and their static CMOS implementations, arithmetic circuits. code converters, multiplexers, decoders and PLAs; Sequential circuit: latches and flip-flops, counters, shift-registers and finite state Machines; Data converters: sample and hold circuits. ADCs and DACs: Semiconductor memories: ROM, SRAM, DRAM; 8-bit microprocessor (8085): architecture, programming, Memory and 1/0 interfacing.

14. Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hulwitz and Nyquist stability criteria: Bode and root-locus plots; Lag, lead and lag-lead compensation; Sate variable model and solution of state equation of LTI systems.

15. Communications

Random processes: autocorrelation ond power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of *AM and FM. superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual Information and channel capacity. theorem; Digital communications: PCM, DPCM,. digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK). QAM. MAP and ML decoding, matched filter receiver, Calculation of bandwidth. SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation: Basics of TDMA, FDMA end CDMA.

16. Electromagnetics

Electrostatics; Maxwell's equation: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, Polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes. boundary conditions. cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of rcdar; Light propagation in optical fibers.

MECHANICAL

17. Applied Mechanics and Design

Engineering Mechanics : Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momenturn (linear and ongular) and energy formulations, collisions.

Mechanics of Materials : Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.

Theory of Machines : Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.

Vibrations : Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.

Machine Design: Design for static and dynamic loading; failure theories: fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, grars, rolling and sliding contact bearings, brakes and clutches springs.

18. Fluid Mechanics and Thermal Sciences

Fluid Mechanics : Fluid properties; fluid statics, manometry, buoyancy, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings.

Heat-Transfer : Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts; thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD end NTU methods; radiative heat transfer. Stefan-Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis.

Thermodynamics : Thermodynamic systems and processes; properties of pure substances, behaviour of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.

Appilcations : Power Engineering : Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. Turbomachinery: Impulse and reaction principles, velocity diagrams. Pelton-wheel, Francis and Kaplan turbines.

19. **Materials, Manufacturing and Industrial Engineering**

Engineering Materials : Structure and properties of engineering materials, phase diagrams, heat treatment, stress-skrain diagrams for engineering materials.

Casting, Forming and Joining Processes : Different types of castings, design of patterns, moulds and cores: solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.

Mochining and Machine Tool Operations : Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, design of Jigs and fixtures.

Metrology and Inspection : Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing : Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control : Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control : Deterministic models; safety stock inventory control systems.

Operations Research : Linear programming, simplex methods, transportation, assignment, network flow models, simple queuing models. PERT and CPM.

COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

1. **Engineering Mathematics**

Discrete Mathematics : Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Groups. Graphs: connectivity, matching, coloring. Combinatorics: counting, recurrence relations, generating functions.

Linear Algebra : Matrices, determinants, system of linear equations, eigenvalues and eigenvectors. LU decomposition.

Calculus : Limits, continuity and differentiability. Maxima and minima. Mean value theorem. Integration.

Probability : Random variables. Uniform, normal, exponential, poisson and binomial distributions. Mean, mediam, mode and standard deviation. Conditional probability and Boyes theorem.

2. **Digital Logic**

Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).

3. **Computer Organization and Architecture**

Machine instructions and addressing modes. ALU. data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).

4. **Programming and Data Structures**

Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps. graphs.

5. Algorithms

Searching, sorting, hashing. Asymptotic worst case time and space complexity. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph search, minimum spanning trees, shortest paths.

6. Theory of Computation

Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

7. Compiler Design

Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

8. Operating System

Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

9. Databases

ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

10. Computer Networks

Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/ IPv6, routers and routing algorithms (distance vector. link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP. HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

PHYSICS

1. Mathematical Physics

Linear vector space: basis, orthogonality and completeness; matrices; vector calculus; linear differential equations; elements of complex analysis: Cauchy- Riemann conditions, Cauchy's theorems, singularities, residue theorem and applications; Laplace transforms, Fourier analysis; elementary ideas about tensors: covariant and contravariant tensor, Levi-Civita and Christoffel symbols.

2. Classical Mechanics

D'Alembert's principle, cyclic coordinates, variational principle, Lagrange's equation of motion, central force and scattering problems, rigid body motion; small oscillations, Hamilton's formalisms; Poisson bracket; special theory of relativity : Lorentz transformations, relativistic kinematics, mass-energy equivalence.

3. Electromagnetic Theory

Solutions of electrostatic and magnetostatic problems including boundary value problems; dielectrics and conductors; Maxwell's equations; scalar and vector potentials; Coulomb and Lorentz gauges; Electromagnetic waves and their reflection, refraction, interference, diffraction and polarization; Poynting vector, Poynting theorem, energy and momentum of electromagnetic waves; radiation from c moving charge.

4. Quantum Mechanics

Postulates of quantum mechanics; uncertainty principle; Schrodinger equation; one-, two- and three-dimensional potential problems; particle in a box, transmission through one dimensional potential barriers, hormonic oscillator, hydrogen atom; linear vectors and operators in Hilbert space; angular momentum and spin; addition of angular momenta; time independent perturbation theory; elementary scattering theory.

5. Thermodynamics and Statistical Physics

Laws of thermodynamics; macrostates and microstates; phase space; ensembles; partition function, free energy, calculation of thermodynamic quantities; classical and quantum statistics; degenerate Fermi gas; black body radiation and Planck's distribution law; Bose-Einstein condensation; first and second order phase transitions, phase equilibria, critical point.

6. Atomic and Molecular Physics

Spectra of one and many-electron atoms; LS and jj coupling; hyperfine structure; Zeeman and Stark effects; electric dipole transitions and selection rules; rotational and vibrational spectra of diatomic molecules; electronic transition in diatomic molecules. Fronck-Condon principle; Raman effect; NMR, ESR, X-ray spectra; lasers: Einstein coefficients, population inversion, two and three level systems.

7. Solid State Physics & Electronics

Elements of crystallography; diffraction methods for structure determination; bonding in solids; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids: nearly free electron and tight binding models; metals, semiconductors and insulators; conductivity, mobility and effective mass; optical, dieletric and magnetic properties of solids; elements of superconductivity: Type-I and Type II superconductors, Meissner effect, London equation.

Semiconductor devices : diodes, Bipolar Junction Transistors, Field Effect Transistors; operational amplifiers: negative feedback circuits, active filters and oscillator; regulated power supplies; basic digital logic circuits, sequential circuits, flip-flops, counters, registers, A/D and D/A conversion.

8. Nuclear and Particle Physics

Nuclear radii and charge distributions, nuclear binding energy, Electric and magnetic moments; nuclear models, liquid drop model: semi-empirical mass formula, Fermi gas model of nucleus, nuclear shell model; nuclear force and two nucleon problem; alpha decay, beta-decay, electromagnetic transitions in nuclei; Rutherford scattering, nuclear reactions, conservation laws; fission and fusion; particle accelerators and detectors; elementary particles, photons. baryons, mesons and leptons; quark model.

HYDRAULICS

Spur, groyne, guard wall, sea wall, pitching, revetment for bank protection, materials used for bank protection, sea wall, guide wall etc., use of Geo Synthetic, Geo Fabric in River Engineering and Bank protection.

Open channel hydraulics, tidal hydraulic engineering, Geo technical investigation related to river engineering work, soil properties (sand, silt, clay), cohesion less material, permeability, drag draw down, bearing capacity, siltation and compaction of soil, behavior of soil water interface, river meandering, cut off, capacity/storage of the river stretch, scour, siltation, scour protection, pile structure, jetty head, hydrographic survey, hydraulic investigation, current and discharge measurement, change detection study etc.

2. Dredging for maintaining Navigational channel, types of dredging, assessment of dredging requirement from Hydrographic survey, under water mapping, side-scan sonar survey, instruments used for Hydrographic survey, instruments for detecting health of pile structures, ROV and its use in River Engineering, Remote sensing and its use in River Engineering, Microwave link for transfer of data in VTM System. Radar surveillance of vessels. VTMS and its purpose-use-basic requirement, Differential Global Positioning System and their use in Hydrographic survey/dredging etc. Different types of current meters, sediment sampler, Acoustic Doppler for measuring river flow/discharge, measurement of turbidity, salinity, single beam eco sounder, multi beam eco sounder, its different use/purpose, water level measurement by sensor, net working and transfer of data to headquarter from the river, instruments used for measuring wave characteristic, meteorological sensor, oil pollution sensor, detection of wind, rainfall humidity, oil pollution, Radio tracer experiment, advection-dispersion of sediment in two way river.

Dredging and disposal in open river as well as shore, radio tracer experiment to detect the return of sediment in case of open river dumping etc.

INSTRUMENTATION TECHNOLOGY

Electrical Circuits, Signals and Systems, Control Systems, Measurements, Sensors and Industrial Instrumentation, Communication and Optical Instrumentation

Some sample questions are given below.

SAMPLE QUESTIONS

ELECTRICAL

Q.1. In circuit breakers, _____ is a voltage that appears across the contacts of circuit breaker during the arcing period.

(1) Arc voltage   (2) Re-striking voltage   (3) Recovery voltage   (4) Blast voltage (5) Gap voltage

ELECTRONICS

Q.1. _____ can be used in a *relaxation oscillator.*

(1) BJT   (2) UJT   (3) SUS   (4) PUT   (5) SCS

C.S & I.T

Q.1. _____ occurs if two different frequencies are sharing a medium and one of them have excessive strength, then the resultant frequency may not be delivered as expected

(1) Delay Distortion (2) Crosstalk (3) Impulse   (4) Thermal Noise   (5) Intermodulation Noise

TELECOMMUNICATION

Q.1. In case of photo diode if the light wave has energy 3.98×10^{-15} J, the operating frequency is _____.

(1) 1.5×10^{15} Hz   (2) 2.5×10^{12} Hz   (3) 3×10^{12} Hz   (4) 5×10^{16} Hz   (5) 6×10^{18} Hz

PHYSICS

Q.1. Which among the following is not a flavour of quarks ?

(1) Strange   (2) Top   (3) Down   (4) Bottom   (5) Above

MECHANICAL

Q.1. Grashof number (Gr) is the ratio of _____
(1) buoyancy to viscous force   (2) inertial force to viscous force
(3) inertial force to gravitational force   (4) viscous to gravitational force
(5) buoyancy to gravitational force

CIVIL

Q.1. Approximately how many metric bricks are required for one cubic metre of brickwork ?

(1) 300   (2) 400   (3) 500   (4) 650   (5) 780

INSTRUMENTATION

Q.1. The ratio of starting torque to maximum torque is 80%. Then the slip at maximum torque is _____

(1) 0.2   (2) 0.3   (3) 0.4   (4) 0.5   (5) 0.6

HYDRAULIC ENGINEERING

Q.1. For navigation in natural waterway, the river bed slope should be _____
(1) large   (2) downward sloping   (3) moderate
(4) reasonably flat   (5) None of those given as options

(A)   Details of the On-line Examination Pattern

(1)   The examination would be conducted on-line i.e. on a computer.

(2)   The test will be provided in English.

(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) 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 Organization.

(15) 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.

(16) After the expiry of 60 minutes, 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.

(17) 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.

(4) You must scrupulously follow the instructions of the Test Administrator and Organization 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 this 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 this 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 Card/E-adhar Card with a photograph/Employee ID/Bar Council Identity card with photograph. **Please Note - Ration Card will NOT be accepted as valid ID proof.** 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 KOPT 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 KOPT recruitment process 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.

(ii) One Ball point pen

WISH YOU GOOD LUCK