

उत्तर प्रदेश जल निगम, लखनऊ

संदर्भ पत्रांक : 1385/अ-2-2/2161-0095/16, दिनांक 28.10.2016 (विज्ञप्ति)

Indicative Syllabus for Computer Based Test for Recruitment of JE(Civil) & JE (Electrical & Mechanical)

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering (Civil/Electrical/Mechanical) from a recognized Institute, Board or University as per advertisement. All the questions will be set in SI units. Each Question will carry one mark and there will be no negative marking. The details of the syllabus are given below:

Sl. No.	Content
1	General Intelligence & Reasoning: 15 Marks The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgement, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.
2	General Awareness: 15 Marks Questions will be aimed at testing the candidate's general awareness of the environment around him/her and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.
3	Technical (Civil, Electrical & Mechanical): 50 Marks i. Civil Engineering Building Materials : Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (Portland), asbestos products, timber and wood based products, laminates, bituminous materials, paints, varnishes. Estimating, Costing and Valuation: estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Mid-section formula, Trapezoidal formula, Simpson's rule. Cost estimate of Septic tank, flexible pavements, Tube well, isolates and combined footings, Steel Truss, Piles and pile-caps. Valuation – Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation. Surveying : Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometric survey, curve setting, earth work calculation, advanced surveying equipment. Soil Mechanics : Origin of soil, phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses. Index properties of soils, Atterberg's limits, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure, normally consolidated soil, e-log p curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth

pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.

Hydraulics : Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

Irrigation Engineering: Definition, necessity, benefits, 2II effects of irrigation, types and methods of irrigation, Hydrology – Measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, etc. Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies. Different type of canals, types of canal irrigation, loss of water in canals. Canal lining – types and advantages. Shallow and deep to wells, yield from a well. Weir and barrage, Failure of weirs and permeable foundation, Slit and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow. Definition of flood, causes and effects, methods of flood control, water logging, preventive measure. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods, description of land and reclamation processes. Major irrigation projects in India.

Transportation Engineering: Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. Surface water drainage. Solid waste management – types, effects, engineered management system. Air pollution – pollutants, causes, effects, control. Noise pollution – cause, health effects, control.

Theory of structures: Elasticity constants, types of beams – determinate and indeterminate, bending moment and shear force diagrams of simply supported, cantilever and over hanging beams. Moment of area and moment of inertia for rectangular & circular sections, bending moment and shear stress for tee, channel and compound sections, chimneys, dams and retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, Torsion of circular section.

Concrete Technology: Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

RCC Design: RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams, lintels. One way and two way slabs, isolated footings. Reinforced brick works, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both Limit State and Working Stress methods).

Steel Design: Steel design and construction of steel columns, beams roof trusses plate girders.

ii. Junior Engineer(E/M)

Concept of simple machine, Power transmission by belts –V-belts and Flat belts, Clutches – Plate and Conical clutch, Gears- Type of gears, gear profile and gear ratio calculation. Equilibrium of forces, law of motion, friction, concepts of stress and strain, elastic limit & elastic constants, stress in composite bars, torsion of circular shafts, Bucking of columns- Euler's and Rankin's theories. 1stLaw of Thermodynamics: Definition of stored energy & internal energy, first law of thermodynamics of cyclic process. 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

	<p>Refrigerator, Carnot Cycle & Carnot Efficiency. Air standard Cycle 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. Air Compressor & their cycles: Refrigeration cycles, Principle of refrigeration plant. Properties & Classification of fluids: Ideal & real fluids, Compressible & incompressible fluids, Newton's law of viscosity, Newtonian and Non-Newtonian fluids. Fluid Statics: Pressure at a point, Measurement of Fluids Pressure: Manometers, U-tube, Inclined tube. Fluid Kinematics: Stream line, laminar & turbulent flow, continuity equation. Dynamics of ideal fluids: Bernoulli's equations, Total head, Velocity head, Pressure head; Application of Bernoulli's equation. Fluid Flow through pipes: Basic Concept Measurement of Flow rate Basic Principle: Venturimeter, Pitot tube, Orifice meter, Notches & Weirs. Hydraulic Turbines: Classifications, Principles. Centrifugal Pumps: Classifications, Principles, Performance. Classification of Steels: Mild steel & alloy steel.</p> <p>Concepts of resistance, inductance, reactance, capacitance & various factor affecting them. Concepts of current, voltage, power energy & their units. Kirchhoff's law, Simple Circuit solution using network theorems. AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Poly phase system- star and delta connections, 3 phase power, DC and sinusoidal response of R-L and R-C circuit. Measurement of power (1 phase & 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving coil and moving iron type.) Multimeters, Megger, Energy meter AC Bridges. DC Machine- Construction, Basic Principles of DC motors & generators, their characteristics, speed control and starting of DC motors. Method of braking motor, Losses and efficiency of DC Machines. 1 phase & 3 phase transformers: Basic Concept, Construction, Principles of operation, equivalent circuit, Voltage regulation, O.C and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase & 3 phase transformers. 3 phase induction motor: Rotating magnetic field, principle of operation, equivalent circuit, torque-speed, characteristics, starting and speed control of 3 phase induction motors. Generation, Transmission and Distribution: Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, inter-connection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears- rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. fuses, Protection against earth leakage/over current, etc. Cable- Different type of cables, cable rating and derating factor.</p>
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CE(E-2-2)

CE(E&M)

SE(E-2-2)