Instruction to the Candidate

1. Examination will be of 3 hours duration which will be conducted on 02 August 2015 from 11.00 A.M. to 2.00 P.M.

2. All candidates are required to report the examination centre 10.00 AM on 02 August 2015. No candidate will be allowed to appear in examination after 11.15 AM. No candidate will be allowed to leave examination hall till completion of examination.

3. No electronic or communicating device including calculator, mobile (even in switched off mode), Bluetooth, Wifi devices or any similar device will be permitted in the examination hall. Any such device would have to be left outside the examination hall at the sole responsibility of candidate themselves and administration would not be responsible for loss/theft of such device.

4. Candidates are required to bring with them their Admit card (issued by the PWD) and one original photo id proof (as approved by the Govt. of India) with one self attested photo copy of the id proof. Copy of the id proof should be retained by the invigilator. Candidate should also bring **BACK BALL POINT PEN** with them and **should not use ink, Gel pen/ pencil.**

5. Question paper will consist of 140 questions. Out of these, 110 questions will be from relevant subject and remaining 30 questions will be of General knowledge.

6. Detailed syllabus is available on the departmental website www.nic.daman.in

7. Each question will have four alternative answers. You have to choose one and only one answer.

8. Please fill all entries related to Name, Roll No. Question Paper code, Date of Examination, Question Paper no. etc. very carefully on OMR sheet. If que4stionj paper code is wrongly filled then answer sheet would be interpreted wrongly and candidate would be solely responsible for the same.

9. All answers have to be marked by darkening appropriate bubble on OMR sheet, which will be provided separately.

10. Bubbles on the OMR sheet should be darkened by BLACK BALL POINT ONLY. Gel pen or pencil should not be used.
11. OMR sheet will be read by machine. Bubbles should be darkened fully. Incomplete darkened bubble may be treated as NOT ATTEMPTED/ WRONG ANSWER. Candidate will be solely responsible for this.
12. Dark one and only one bubble. Multiple answers by darkening more than one bubble will be treated as WRONG ANSWER.
13. Do not write anything anywhere in the question paper or OMR sheet except darkening the bubbles and doing rough work in the space provided at the end of question booklet. Violation of this will be treated as the case of UNFAIR MEANS.
14. Each correct answer will be awarded (1/2) mark. Each wrong answer will be answered (-1/4) mark. EACH NOT ATTEMPTED question will be awarded (0) mark.
15. After completion of the examination, both question booklet and OMR sheet should be returned to the invigilator.
16. Carbon copy of the OMR sheet should be retained by the candidate which he/she should take with him/ her.
17. Provisional answer keys and provisional mark list will be available only on departmental website within one week of one date of examination. Candidate may give their grievances, if any, within three working days of publication of provisional answer key and provisional mark list.
18. Any case of unfair means will be treated as per rules. Candidates may be debarred to appear in Government examination for next 3 years.

Syllabus for GENERAL KNOWLEDGE (Objective type)

Common to both branches

General Science, current events of national and international importance, history and culture of India, geography, Indian Polity, Indian economy, Indian National Movement and Freedom struggle, Mental ability tests and other related fields. Questions on general science will cover general appreciation and understanding of science, including matters of every day observation and experience as may be expected of an educated person. In geography emphasis will be on geography of India including the physical, social, economic, geography and on the main features of Indian agriculture and natural resources. Questions on Indian polity and economy will test knowledge on the country's political, executive, Judicial System, Panchayat raj, Rural and Community Development and Economic Planning in India. Questions on Indian National Movement will relate to the nature and character of the Nineteenth century resurgence, growth of nationalism and attainment of independence. General mental ability test will include analysis of classified data, logical and behavioural reasoning, analogies, school arithmetic, numerical ability and basic concepts of computers. Current events will include latest developments on all the fields detailed above including science and technology

Syllabus for Civil Engineering (Objective type)

1. Engineering Mechanics, Strength of Materials and Structural Analysis:

1.1 Engineering Mechanics:

Units and Dimensions, SI Units, Vectors, Concept of Force, Concept of particle and rigid body. Concurrent, Non Concurrent and parallel forces in a plane, moment of force, free body diagram, conditions of equilibrium, Principle of virtual work, equivalent force system.

First and Second Moment of area, Mass moment of Inertia.

Static Friction.

Kinematics and Kinetics:

Kinematics in Cartesian Co-ordinates, motion under uniform and nonuniform acceleration, motion under gravity. Kinetics of particle: Momentum and Energy principles, collision of elastic bodies, rotation of rigid bodies.

1.2 Strength of Materials:

Simple Stress and Strain, Elastic constants, axially loaded compression members, Shear force and bending moment, theory of simple bending, Shear Stress distribution across cross sections, Beams of uniform strength.

Deflection of beams: Macaulay's method, Mohr's Moment area method, Conjugate beam method, unit load method. Torsion of Shafts, Elastic stability of columns, Euler's Rankine's and Secant formulae.

1.3 Structural Analysis:

Castiglianio's theorems I and II, unit load method of consistent deformation applied to beams and pin jointed trusses. Slope-deflection, moment distribution,

Rolling loads and Influences lines: Influences lines for Shear Force and Bending moment at a section of beam. Criteria for maximum shear force and bending Moment in beams traversed by a system of moving loads. Influences lines for simply supported plane pin jointed trusses.

Arches: Three hinged, two hinged and fixed arches, rib shortening and temperature effects.

Matrix methods of analysis: Force method and displacement method of analysis of indeterminate beams and rigid frames.

Plastic Analysis of beams and frames: Theory of plastic bending, plastic analysis, statical method, Mechanism method.

Unsymmetrical bending: Moment of inertia, product of inertia, position of Neutral Axis and Principle axes, calculation of bending stresses.

2. Design of Structures: Steel, Concrete and Masonry Structures:

2.1 Structural Steel Design:

Structural Steel: Factors of safety and load factors. Riveted, bolted and welded joints and connections. Design of tension and compression member, beams of built up section, riveted and welded plate girders, gantry girders, stancheons with battens and lacings.

2.2 Design of Concrete and Masonry Structures:

Concept of mix design. Reinforced Concrete: Working Stress and Limit State method of design–Recommendations of I.S. codes Design of one way and two way slabs, stair-case slabs, simple and continuous beams of rectangular, T and L sections. Compression members under direct load with or without eccentricity,

Cantilever and Counter fort type retaining walls.

Water tanks: Design requirements for Rectangular and circular tanks resting on ground.

Prestressed concrete: Methods and systems of prestressing, anchorages, Analysis and design of sections for flexure based on working stress, loss of prestress.

Design of brick masonry as per I.S. Codes

3. Construction Technology, Equipment, Planning and Management:

3.1 Construction Technology:

Engineering Materials:

Physical properties of construction materials with respect to their use in construction - Stones, Bricks and Tiles; Lime, Cement, different types of Mortars and Concrete.

Specific use of ferro cement, fibre reinforced C.C, High strength concrete.

Timber, properties and defects - common preservation treatments.

Use and selection of materials for specific use like Low Cost Housing, Mass Housing, High Rise Buildings.

3.2 Construction:

Masonry principles using Brick, stone, Blocks – construction detailing and strength characteristics.

Types of plastering, pointing, flooring, roofing and construction features.

Common repairs in buildings.

Principles of functional planning of building for residents and specific use - Building code provisions.

Basic principles of detailed and approximate estimating - specification writing and rate analysis – principles of valuation of real property.

Machinery for earthwork, concreting and their specific uses – Factors affecting selection of equipments – operating cost of Equipments.

3.3 Construction Planning and Management:

Construction activity – schedules- organization for construction industry – Quality assurance principles.

Use of Basic principles of network – analysis in form of CPM and PERT – their use in construction monitoring, Cost optimization and resource allocation.

Basic principles of Economic analysis and methods.

Project profitability – Basic principles of Boot approach to financial planning – simple toll fixation criterions.

4. Surveying and Transportation Engineering

4.1 Surveying:

Common methods and instruments for distance and angle measurement for CE work – their use in plane table, traverse survey, leveling work, triangulation, contouring and topographical map.

Basic principles of photogrammetry and remote sensing.

4.2 Railway Engineering:

Permanent way – components, types and their functions – Functions and Design constituents of turn and crossings – Necessity of geometric design of track – Design of station and yards.

4.3 Highway Engineering:

Principles of Highway alignments – classification and geometrical design elements and standards for Roads.

Pavement structure for flexible and rigid pavements - Design principles and methodology of pavements.

Typical construction methods and standards of materials for stabilized soil, WBM, Bituminous works and CC roads.

Surface and sub-surface drainage arrangements for roads - culvert structures.

Pavement distresses and strengthening by overlays.

Traffic surveys and their applications in traffic planning - Typical design features for channelized, intersection, rotary etc – signal designs – standard Traffic signs and markings.

5. Fluid Mechanics, Open Channel Flow and Hydraulic Machines:

5.1 Fluid Mechanics:

Fluid properties and their role in fluid motion, fluid statics including forces acting on plane and curved surfaces.

Kinematics and Dynamics of Fluid flow: Velocity and accelerations, stream lines, equation of continuity, irrotational and rotational flow, velocity potential and stream functions.

Continuity, momentum and energy equation, Navier-Stokes equation, Euler's equation of motion, application to fluid flow problems, pipe flow, sluice gates, weirs.

5.2 Dimensional Analysis and Similitude:

Buckingham's Pi-theorem, dimensionless parameters.

5.3 Laminar Flow:

Laminar flow between parallel, stationary and moving plates, flow through tube.

5.4 Boundary layer: Laminar and turbulent boundary layer on a flat plate, laminar sub layer, smooth and rough boundaries, drag and lift. Turbulent flow through pipes: Characteristics of turbulent flow, velocity distribution and variation of pipe friction factor, hydraulic grade line and total energy line.

5.5 Open channel flow:

Uniform and non-uniform flows, momentum and energy correction factors, specific energy and specific force, critical depth, rapidly varied flow, hydraulic jump, gradually varied flow, classification of surface profiles, control section, step method of integration of varied flow equation.

5.6 Hydraulic Machines and Hydropower:

Hydraulic turbines, types classification, Choice of turbines, performance parameters, controls, characteristics, specific speed. Principles of hydropower development.

7. Geotechnical Engineering:

Soil Type and structure – gradation and particle size distribution – consistency limits.

Water in soil – capillary and structural – effective stress and pore water pressure – permeability concept – field and laboratory determination of permeability – Seepage pressure – quick sand conditions – Shear strength determination – Mohr Coulomb concept.

Compaction of soil – Laboratory and field tests.

Compressibility and consolidation concept – consolidation theory – consolidation settlement analysis.

Earth pressure theory and analysis for retaining walls, Application for sheet piles and Braced excavation.

Bearing capacity of soil – approaches for analysis – Field tests – settlement analysis – stability of slope of earth walk.

Subsurface exploration of soils – methods

Foundation – Type and selection criteria for foundation of structures – Design criteria for foundation – Analysis of distribution of stress for footings and pile – pile group action-pile load test. Ground improvement techniques.

8. Hydrology, Water Resources and Engineering:

8.1 Hydrology:

Hydrological cycle, precipitation, evaporation, transpiration, infiltration, overland flow, hydrograph, flood frequency analysis, flood routing through a reservoir, channel flow routing-Muskingam method.

8.2 Ground water flow:

Specific yield, storage coefficient, coefficient of permeability, confined and unconfined equifers, aquifers, aquitards, radial flow into a well under confined and unconfined conditions.

8.3 Water Resources Engineering:

Ground and surface water resource, single and multipurpose projects, storage capacity of reservoirs, reservoir losses, reservoir sedimentation.

8.4 Irrigation Engineering:

(i) Water requirements of crops: consumptive use, duty and delta, irrigation methods and their efficiencies.

(ii) Canals: Distribution systems for canal irrigation, canal capacity, canal losses, alignment of main and distributory canals, most efficient section, lined canals, their design, regime theory, critical shear stress, bed load.

(iii) Water logging: causes and control, salinity.

(iv) Canal structures: Design of, head regulators, canal falls, aqueducts, metering flumes and canal outlets.

(v) Diversion headwork: Principles and design of weirs of permeable and impermeable foundation, Khosla's theory, energy dissipation.

(vi) Storage works: Types of dams, design, principles of rigid gravity, stability analysis.

(vii) Spillways: Spillway types, energy dissipation.

(viii) River training: Objectives of river training, methods of river training.

9. Environmental Engineering:

9.1 Water Supply:

Predicting demand for water, impurities, of water and their significance, physical, chemical and bacteriological analysis, waterborne diseases, standards for potable water.

9.2 Intake of water:

Water treatment: principles of coagulation, flocculation and sedimentation; slow-; rapid-, pressure-, filters; chlorination, softening, removal of taste, odour and salinity.

9.3 Sewerage systems:

Domestic and industrial wastes, storm sewage–separate and combined systems, flow through sewers, design of sewers.

9.4 Sewage characterization:

BOD, COD, solids, dissolved oxygen, nitrogen and TOC. Standards of disposal in normal watercourse and on land.

9.5 Sewage treatment:

Working principles, units, chambers, sedimentation tanks, trickling filters, oxidation ponds, activated sludge process, septic tank, disposal of sludge, recycling of wastewater.

9.6 Solid waste: Collection and disposal in rural and urban contexts, management of long-term ill effects.

10. Environmental pollution: Sustainable development. Rawastes and disposal. Environmental impact assessment for thermal power plants, mines, river valley projects. Air pollution. Pollution control acts

Syllabus for Electrical Engineering (Objective type)

Circuit Theory: Circuit components; network graphs; KCL, KVL; circuit analysis methods: nodal analysis, mesh analysis; basic network theorems and applications; transient analysis: RL, RC and RLC circuits; sinusoidal steady state analysis; resonant circuits; coupled circuits; balanced 3-phase circuits; Two-port networks.

Signals & Systems: Representation of continuous-time and discrete-time signals & systems; LTI systems; convolution; impulse response; time-domain analysis of LTI systems based on convolution and differential/difference equations. Fourier transform, Laplace transform, Z-transform, Transfer function. Sampling and recovery of signals DFT, FFT Processing of analog signals through discrete-time systems.

E.M. Theory: Maxwell's equations, wave propagation in bounded media. Boundary conditions, reflection and refraction of plane waves. Transmission line: travelling and standing waves, impedance matching, Smith chart.

Analog Electronics: Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET and MOSFET. Diode circuits: clipping, clamping, rectifier. Biasing and bias stability.FET amplifiers. Current mirror; Amplifiers: single and multi-stage, differential, operational, feedback and power. Analysis of amplifiers; frequencyresponse of amplifiers.OPAMP circuits. Filters; sinusoidal oscillators: criterion for oscillation; single-transistor and OPAMP configurations. Function generators and wave-shaping circuits. Linear and switching power supplies.

Digital Electronics: Boolean algebra; minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combina-tional circuits: arithmetic circuits, code converters, multiplexers and decoders. Sequential circuits: latches and flip-flops, counters and shift-registers. Comparators, timers, multivibrators. Sample and hold circuits, ADCs and DACs. Semiconductor memories.Logic implementation using programmable devices (ROM, PLA, FPGA).

Energy Conversion: Principles of electromechanical energy conversion: Torque and emf in rotating machines. DC machines: characteristics and performance analysis; starting and speed control of motors; Transformers: principles of operation and analysis; regulation, efficiency; 3-phase transformers. 3-phase induction machines and synchronous machines: characteristics and performance analysis; speed control.

Power Electronics and Electric Drives: Semiconductor power devices: diode, transistor, thyristor, triac, GTO and MOSFET-static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters: fullycontrolled and half-controlled; principles of thyristor choppers and inverters; DCDC converters; Switch mode inverter; basic concepts of speed control of dc and ac Motor drives applications of variablespeed drives.

Analog Communication: Random variables: continuous, discrete; probability, probability functions. Statistical averages; probability models; Random signals and noise: white noise, noise equivalent bandwidth; signal transmission with noise; signal to noise ratio. Linear CW modulation: Amplitude modulation: DSB, DSB-SC and SSB. Modulators and Demodulators; Phase and Frequency modulation: PM & FM signals; narrowband FM; generation & detection of FM and PM, De-emphasis, Pre-emphasis. CW modulation system: Superhetrodyne receivers, AM receivers, communication receivers, FM receivers, phase locked loop, SSB receiver Signal to noise ratio calculation for AM and FM receivers.

Control Systems: Elements of control systems; block-diagram representation; open-loop & closedloop systems; principles and applications of feed-back. Control system components. LTI systems: time-domain and transform-domain analysis. Stability: Routh Hurwitz criterion, root-loci, Bodeplots and polar plots, Nyquist's criterion; Design of lead-lad compensators. Proportional, PI, PID controllers.Statevariable representation and analysis of control systems.

Microprocessors and Microcomputers: PC organisation; CPU, instruction set, register set, timing diagram, programming, interrupts, memory interfacing, I/O interfacing, programmable peripheral devices.

Measurement and Instrumentation: Error analysis; measurement of current, voltage, power, energy, power-factor, resistance, inductance, capacitance and frequency; bridge measurement. Signal conditioning circuit; Electronic measuring instruments: multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum-analyzer, distortion-meter. Transducers: thermocouple, thermistor, LVDT, strain-gauge, piezo-electric crystal.

Power Systems: Analysis and Control: Steady-state performance of overhead transmission lines and cables; principles of active and reactive power transfer and distribution; per-unit quantities; bus admittance and impedance matrices; load flow; voltage control and power factor correction; economic operation; symmetrical components, analysis of symmetrical and unsymmetrical faults. Concept of system stability: swing curves and equal area criterion. Static VAR system.Basic concepts of HVDC transmission.

Power System Protection: Principles of overcurrent, differential and distance protection. Concept of solid state relays. Circuit breakers. Computer aided protection: Introduction; line bus, generator, transformer protection; numeric relays and application of DSP to protection.

Digital Communication: Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM), Digital modulation and demodulation schemes: amplitude, phase and frequency keying schemes (ASK, PSK, FSK). Error control coding: error detection and correction, linear block codes, convolution codes. Information measure and source coding. Data networks, 7-layer architecture.