महाराष्ट्र अभियांत्रिकी सेवा (स्थापत्य),गट - अ व ब (पूर्व) परीक्षा

परीक्षेचे टप्पे : **१) पूर्व परीक्षा :-** गट अ - १०० गुण गट ब - १०० गुण
२) मुख्य परीक्षा :- गट अ - ५५० गुण गट ब - ५५० गुण
३) मुलाखत गुण:- गट अ - ७५ गुण गट ब - ७५ गुण

परीक्षा योजना

विषय व संकेतांक	गुण व प्रश्नसंख्या	कालावधी	दर्जा	माध्यम	प्रश्नपत्रिकेचे स्वरुप
स्थापत्य अभियांत्रिकी (028)	१००	दोन तास	पदवी	इंग्रजी	वस्तुनिष्ठ बहुपर्यायी

अभ्यासक्रम

स्थापत्य अभियांत्रिकी या विषयामध्ये खालील घटक व उपघटकांचा समावेश असेल

Engineering Mathematics

Linear Algebra:
Matrix algebra, Systems of linear equations, Eigen values and eigenvectors

Calculus:
Functions of single variable, Limit, continuity and differentiability, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations:
First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one dimensional heat and wave equations and Laplace equation.

Numerical Methods:
Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpson's rule, single and multi-step methods for differential equations.

Structural Engineering

Mechanics:
Bending moment and shear force in statically determinate bearns. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle. Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses.

Structural Analysis:
Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/ energy methods, analysis by displacement methods (slope deflection and moment distribution methods), influence lines for determinate and indeterminate structures. Basic concepts of matrix methods of structural analysis.

Concrete Structures:
Concrete design- basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods. Basic elements of prestressed concrete, analysis of beam sections at transfer and service loads.

Steel Structures:
Analysis and design of tension and compression members, beams and beam- columns, column bases. Connections- simple and eccentric, beam column connections, plate girders and trusses. Plastic analysis of beams and frames. Rivet and Bolted Connections.

Geotechnical Engineering

Soil Mechanics:
Origin of soils, soil classification, three-phase system, fundamental definitions, relationship and interrelationships, permeability & seepage, effective stress principle, consolidation, compaction, shear strength.

Foundation Engineering:
Sub-surface investigations- scope, drilling bore holes, sampling, penetration tests, plate load test. Earth pressure theories, effect of water table, layered soils. Stability of slopes infinite slopes, finite slopes. Foundation types-foundation design requirements. Shallow foundations-bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands & clays. Deep foundations pile types, dynamic & static formulae, load capacity of piles in sands & Clays, negative Skin friction.

Water Resources Engineering

Fluid Mechanics and Hydraulics:
Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations, potential flow, applications of momentum and Bernoulli's equation, laminar and turbulent flow, flow in pipes, pipe networks. Concept of boundary layer and its growth. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Forces on immersed bodies, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling. Kinematics of flow, velocity triangles and specific speed of pumps and turbines.

Hydrology:
Hydrologic cycle, rainfall, evaporation, infiltration, stage discharge relationships, unit hydro graphs, flood estimation, reservoir capacity, reservoir and channel routing. Well hydraulics.

Irrigation:
Duty, delta, estimation of evapo-transpiration. Crop water requirements. Design of: lined and unlined canals, waterways, head works, gravity dams and spillways. Design of weirs on permeable foundation. Types of irrigation system, irrigation methods. Water logging and drainage, sodic soils.

Environmental Engineering

Water requirements:
Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards. Domestic wastewater treatment, quantity of characteristics of domestic wastewater, primary and secondary treatment Unit operations and unit processes of domestic wastewater, sludge disposal.

Air Pollution:
Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Municipal Solid Wastes:
Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

Noise Pollution:
Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

Transportation Engineering

Highway Planning:

Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

Traffic Engineering:

Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity.

Surveying

Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions, leveling, theodolite traversing, plane table surveying, errors and adjustments, curves.

Building Materials & Construction

Construction Materials:

Properties of concrete, basics of mix design, aggregates, admixtures; stones, bricks and flooring tiles; cement; cement mortars; damp-proofing and water proofing materials, termite proofing, paints, epoxy coatings and resins, materials for low cost housing.

Building components and their functions:

Brick masonry, types of floors & roofs, ventilators, introduction to repairs and retrofitting in buildings. Building orientation, circulation, grouping of areas, privacy concept and design of energy efficient building; provisions of National Building Code. building estimates and specifications, cost of works, valuation.

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Date:11/11/2014
PIace: Mumbai

C.V.Pawar
Under Secretary
M.P.S.C

महाराष्ट्र अभियांत्रिकी सेवा (स्थापत्य), गट-'अ' व गट -'ब' (मुख्य) परीक्षा

परीक्षेचे टप्पे :- लेखी परीक्षा - ५५० गुण, **मुलाखत** - ७५ गुण.

प्रश्नपत्रिकांची संख्या:- तीन

-: परीक्षा योजना :-

पेपर क्रमांक व संकेतांक	विषय	माध्यम	दर्जा	गुण/ प्रश्नसंख्या	कालावधी	प्रश्नपत्रिकेचे स्वरूप
१ (अनिवार्य) (संकेतांक ०१४)	मराठी इंग्रजी सामान्य अध्ययन	मराठी इंग्रजी मराठी व इंग्रजी	बारावी / पदवी	१५०/१५०	दीड तास	वस्तुनिष्ठ बहुपर्यायी
२ (अनिवार्य) (संकेतांक ०१८)	स्थापत्य अभियांत्रिकी (पेपर - १)	इंग्रजी	बी.ई (सिव्हील)	२००/१००	दोन तास	वस्तुनिष्ठ बहुपर्यायी
३ (अनिवार्य) (संकेतांक ०१९)	स्थापत्य अभियांत्रिकी (पेपर - 2)	इंग्रजी	बी.ई (सिव्हील)	२००/१००	दोन तास	वस्तुनिष्ठ बहुपर्यायी

-: अभ्यासक्रम :-

मराठी, इंग्रजी, सामान्य अध्ययन या विषयामध्ये खालील घटक व उपघटकांचा समावेश असेल.

❖ **मराठी**

सर्व सामान्य शब्दसमूह, वाक्यरचना, व्याकरण, म्हणी व वाक्प्रचार यांचा अर्थ व उपयोग तसेच उताऱ्यावरील प्रश्नांची उत्तरे .

❖ **इंग्रजी**

Common Vocabulary, Sentence structure, Grammar, Use of Idioms and phrases & their meaning and comprehension of passage

❖ **सामान्य अध्ययन**

(१) भारताचा विशेषत: महाराष्ट्राचा इतिहास (१८५७ ते १९९०)

(२) भारतीय अर्थव्यवस्था

१. भारतीय आयात – निर्यात
२. राष्ट्रीय विकासात सरकारी, सहकारी,ग्रामीण बँकांची भूमिका
३. शासकीय अर्थव्यवस्था - अर्थसंकल्प,लेखा,लेखापरीक्षण, इत्यादी .
४. पंचवार्षिक योजना
५. किंमती वाढण्याची कारणे व उपाय.

(३) भारताचा विशेषत: महाराष्ट्राचा भूगोल

(४) पर्यावरण :- मानवी विकास व पर्यावरण,पर्यावरण - पूरक विकास, नैसर्गिक साधनसंपत्तीचे संधारण विशेषत: वनसंधारण, विविध प्रकारची प्रदूषणे व पर्यावरणीय आपत्ती, पर्यावरण संवर्धनात कार्यरत असलेल्या राज्य / राष्ट्र/ जागतिक पातळीवरील संघटना / संस्था.

(५) भारतीय राज्यव्यवस्था

(६) जागतिक तसेच भारतातील चालू घडामोडी :- राजकीय,औद्योगिक,आर्थिक, सामाजिक, शैक्षणिक, भौगोलिक, खगोलशास्त्रीय, सांस्कृतिक, वैज्ञानिक, इत्यादी .

Civil Engineering, Paper - I
(Code No. 018)

Standard: Degree in Civil Engineering **Max. Marks :** 200
Medium: English **No. of Question :** 100
Nature of paper: Objective **Duration :** 2 hrs

1. **Building Counstruction & Materials**: Properties of wet and hardened concrete, tests on concrete, factors affecting strength of concrete, water-cement ratio, aggregate-cement ratio, mix design, additives, design of form work, types of formwork

   Stones, bricks, cements, lime, mortar, timber, plastic, concrete, steel, paints and varnishes

   Principles of building planning and design, integrated approach, building byelaws, building services such as vertical transportation, water supply sanitation, thermal ventilation, lighting, acoustics, fire protection, electrical fittings.

   Foundations, stones, brick and block masonry, steel and reinforced cement concrete structures, floors, doors and windows, roofs, finishing works, water proofing.

2. **Strength of materials**: Stresses, strains, principal stresses, bending moments, shear forces and torsion theory, bending theory of beam, deflection of beam, theories of buckling of columns.

3. **Theory of structures:** Analysis of beams, frames and trusses, slope deflection method, moment distribution method.

4. **Structural analysis**: Analysis of arches and suspension cables, influence lines, stiffness and flexibility matrix methods

5. **Steel structures**: Design of bolted and welded connections, columns, footings, trusses, steel beams, plate girders.

6. **Design of reinforced concrete structures** (Working stress and limit state): Design of slab, beams, columns, footing. retaining walls, tanks, building frames, staircases

7. **Prestressed Concrete**: Principles of prestressing, materials used and their properties, permissible stresses as per I.S. codes, systems of prestressing, losses in prestress, design of pre-tensioned and post-tensioned beams- simply supported, rectangular and T- beams, cable profile, end block design, bridge girder.

8. **Construction Planning and Management:** Elements of scientific management, elements of material management, safety engineering, network analysis, construction equipment, site layout, quality control.

9. **Computer-aided analysis and design of structures, application of computer programming to structures. numerical methods such as-**
   i. Finding area by Simpson's rule, trapezoidal rule;
   ii. Finding root of an equation by a) Newton-Raphsons techniques b)Bisection method
   iii. Solution of simultaneous equations by a) Gauss elimination method, b) Gauss-Jordan method, c) Iteration method.

Civil Engineering, Paper –II
(Code No. 019)

Standard: Degree in Civil Engineering **Max. Marks :** 200
Medium: English **No. of Question :** 100
Nature of paper: Objective **Duration:** 2 hrs.

1 **Surveying:** Classification of surveys, measurement of distances-direct and indirect methods, optical and electronic devices, prismatic compass, local attraction; plane table surveying, levelling, calculations of volumes, contours, theodolite, theodolite traversing, omitted measurements, trigonometric levelling, tacheometry, curves, photogrammetry, geodetic surveying, hydrographic surveying.

2 **Estimating, Costing and Valuation:** Specification, estimation, costing, tenders and contracts, rate analysi**s**, valuation

3 **Geo-technical Engineering:** Geotechnical properties, stresses in soil, shear resistance, compaction, consolidation and earth pressure, stability of slopes, bearing capacity, settlements, shallow and deep foundations, cofferdams, ground water control.

4 **Fluid Mechanics:** Properties of fluids, fluid statics and buoyancy, kinematics and dynamics, flow measurement, flow in open channel, flow in closed conduits, dimensional and model analysis, losses in pipe flow, siphon, water hammer, boundary layer and control, pipe network.

5 **Fluid Machines:** Hydraulic turbines, centrifugal pumps, reciprocating pumps**,** power house, classification and layout.

6 **Engineering Hydrology**: Hydrological cycle, precipitation, evaporation, infiltration, runoff, hydrographs, reservoir planning & sediment control, floods, flood routing, ground water.

7 **Irrigation Engineering**: Water requirement of crops, methods of irrigation, lift irrigation, water logging, dams, spillways, energy dissipation, diversion head works, canal and canal structures, cross drainage works, river training works.

8 **Highway Engineering**: Planning of highway systems, alignment and geometric design, horizontal and vertical curves, grade separation, materials and different surfaces and maintenance, rigid and flexible pavement, traffic engineering

9 **Bridge Engineering**: Selection of site, types of bridges, discharge, waterway, spans, afflux, scour, standards, specifications, loads and forces, erection of superstructure, strengthening.

10 **Tunnelling:** Open cuts, surveys, criteria for selection of size and shapes, driving in soft and hard grounds, mucking, dust control, ventilation, lighting and drainage, special methods of tunneling.

11 **Environmental Engineering**

Water Supply Engineering: Sources of supply, design of intakes, estimation of demand, water quality standards, primary and secondary treatment, maintenance of treatment units, conveyance and distribution of treated water, rural water supply.

Waste Water Engineering & Pollution control: Quantity, collection and conveyance and quality, disposal, design of sewer and sewerage systems, pumping, characteristics of sewage and its treatment, rural sanitation, sources and effects of air and noise pollution, monitoring, standards

Solid Waste Management: Sources, classification, collection and disposal.

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Date:11/11/2014 **C.V.Pawar**
PIace: Mumbai **Under Secretary**
M.P.S.C