

(क) कनिष्ठ अभियन्ता (सिविल) (डिग्री)

परीक्षा की स्कीम

प्रश्न-पत्र	अंक	अधिकतम अंक	समय
<b>भाग-अ :-</b> सामान्य ज्ञान (राजस्थान का इतिहास, कला एवं संस्कृति, परम्पराएँ, विरासत एवं राजस्थान का भूगोल)	40	120 अंक	2 घण्टे
<b>भाग-ब :-</b> सिविल अभियांत्रिकी(डिग्री)	80		

नोट :-

1. प्रश्न पत्र में बहुविकल्पीय प्रकार के प्रश्न होंगे व सभी प्रश्नों के अंक समान होंगे।
2. परीक्षा में न्यूनतम निर्धारित उत्तीर्णांक अंक 40 प्रतिशत है। इससे कम अंक प्राप्त करने वाले अभ्यर्थी नियुक्ति के लिए पात्र नहीं होंगे।

**पाठ्यक्रम (Syllabus)**

**भाग-अ :- सामान्य ज्ञान**

राजस्थान का इतिहास, कला एवं संस्कृति, साहित्य, परम्पराएँ एवं विरासत	
1.	राजस्थान के इतिहास के प्रमुख स्रोत
2.	राजस्थान की प्रमुख प्रागैतिहासिक सभ्यताएँ
3.	राजस्थान के प्रमुख राजवंश एवं उनकी उपलब्धियाँ
4.	मुगल-राजपूत संबंध
5.	स्थापत्य कला की प्रमुख विशेषताएँ
6.	महत्वपूर्ण किले, स्मारक एवं संरचनाएँ
7.	राजस्थान के धार्मिक आंदोलन एवं लोक देवी-देवताएँ
8.	राजस्थान की प्रमुख चित्रकलाएँ, शैलियाँ एवं हस्तशिल्प
9.	राजस्थानी भाषा एवं साहित्य की प्रमुख कृतियाँ, क्षेत्रीय बोलियाँ
10.	मेले, त्यौहार, लोक संगीत, लोक नृत्य, वाद्ययंत्र एवं आभूषण
11.	राजस्थानी संस्कृति, परंपरा एवं विरासत
12.	महत्वपूर्ण ऐतिहासिक पर्यटन स्थल
13.	राजस्थान के प्रमुख व्यक्तित्व
14.	राजस्थान की रियासतें एवं ब्रिटिश संधियाँ, 1857 का जन-आंदोलन
15.	कृषक एवं जन-जाति आंदोलन, प्रजामंडल आंदोलन
16.	राजस्थान का एकीकरण
17.	राजस्थान का राजनीतिक जनजागरण एवं विकास- महिलाओं के विशेष संदर्भ में
राजस्थान का भूगोल	
1.	स्थिति एवं विस्तार
2.	मुख्य भौतिक विभाग :- मरुस्थलीय प्रदेश, अरावली पर्वतीय प्रदेश, मैदानी प्रदेश, पठारी प्रदेश
3.	अपवाह तन्त्र
4.	जलवायु
5.	मृदा
6.	प्राकृतिक वनस्पति
7.	वन एवं वन्य जीव संरक्षण
8.	पर्यावरणीय एवं पारिस्थितिकीय मुद्दे
9.	मरुस्थलीकरण
10.	कृषि-जलवायु प्रदेश एवं प्रमुख फसलें
11.	पशुधन
12.	बहुउद्देशीय परियोजनाएँ
13.	सिंचाई परियोजनाएँ
14.	जल संरक्षण
15.	परिवहन
16.	खनिज सम्पदाएँ

## भाग-ब :- सिविल अभियांत्रिकी (डिग्री)

### 1. Building Technology And Construction Management

Building Materials: stones, bricks, steel, Timber, lime, cement, sand, aggregates for cement concrete, paints, distempers, use of pozzolana manufacturing of lime concrete, cement concrete for plain, reinforced and pre-stressed concrete work.

Road Materials: Coarse aggregate, screenings and binding materials for WBM, Bricks for soling, Coarse and fine aggregate for bituminous roads, IRC standard size aggregates, Tars and Asphalt, Asphaltic concrete, Asphaltic emulsions, Mastic Asphalt and Minerals fillers

Construction Management: Plants and equipments, Planning for construction using network analysis CPM and PERT techniques

### 2. Fluid Mechanics

**Fluids:** Definition, Ideal fluids, real fluids, Newtonian and non-Newtonian fluids.

**Properties of Fluids:** Units of measurement, Mass density, Specific weight, Specific volume, Specific Gravity, Viscosity, Surface tension and Capillarity, Compressibility and Elasticity.

**Hydrostatics:** Pressure at a point in a static fluid; pressure variation in an incompressible static fluid; atmospheric pressure, Gauge pressure, vacuum pressure, absolute pressure, Manometers Bourdon pressure gauge.

**Buoyancy:** Forces acting on immersed plane surface. Centre of pressure, forces on curved surfaces. Conditions of equilibrium for floating bodies, meta-centre and metacentric height experimental and analytical determination of metacentric height.

**Equilibrium of fluid particles and flow:** Fluid mass subjected to horizontal and vertical acceleration and uniform rotation.

**Hydro-kinematics:** Types of Flows: Steady and unsteady, uniform and non-uniform, streamlines, pathlines, stream tubes, principles of conservation of mass, equation of continuity, acceleration of fluid particles local and convective, Rotational and irrotational motions, free and forced vortex, circulation and vorticity velocity potential and stream function, elementary treatment of flow net. Euler's equation of motion and integration of Euler's equations, Bernoulli's equation for incompressible fluids, assumptions in Bernoulli's equation, Energy correction factor.

#### **Applications of Bernoulli's equation:**

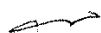
Pitot tube, Venturimeter, orificemeter, orifices & mouthpieces, time of emptying of tanks by orifices, sharp edged rectangular, triangular and trapezoidal notches, Francis formula. Velocity of approach. End contractions Cippolletti Weir, time of emptying reservoirs by weirs.

**Momentum Equation and its Application:** Development of momentum equation by control volume concept, Momentum correction factor, applications – Borda's mouthpieces, sudden enlargement of flow, pressure on flat plates, Nozzles.

**Flow Through Pipes:** Laminar flow, Reynold's experiment, transition from laminar to turbulent flow. Turbulent flow: Law of fluid friction, friction factor Moody's diagram, loss of head due to friction and other causes. Hydraulic gradient, total energy line Chezy's, Darcy's and Manning's formula, flow through parallel pipes and pipes in series, flow through branched pipes. Flow along a bypass. Power transmission through pipe, condition for maximum power. Elementary water hammer concept.

### 3. Surveying, Estimating Costing & Field Engineering

**Introduction: Importance** of surveying to engineers, Plane and geodetic surveying, methods of location of points, principle of surveying from whole to part, conventional signs.



**Measurement of Distances:** Different types of chains, tapes and their uses. Sources of error and precautions, correction to tape measurements. Field problems in distance measurement. Advance techniques of distance measurements.

**Measurement of Angles & Direction:** Different types of direction measuring instruments and their uses. Reference meridians, Bearing and azimuths, magnetic declination and its variation. Use and adjustment of surveyors and prismatic compass.

Vernier and micro-optic theodolite, temporary and permanent adjustment of vernier theodolite. Measurement of horizontal and vertical angle by different methods. Application of the theodolite in field problems.

**Traversing:** Different methods of traversing; chain traverse, chain & compass traverse, transit-tape traverse. Methods of computations and adjustment of traverse; transit rule, Bowditch rule, graphical method, axis method. Gales traverse table.

**Leveling:** Definitions of various terms in leveling. Different types of leveling, sources of errors in leveling curvature and refraction corrections. Temporary and permanent adjustment of dumpy and tilting levels. Computation and adjustment of levels. Profile leveling; L-Section and cross-sections.

**Plane Table Surveying:** Elements of plane table survey working operations, methods of plane table survey; intersection, traversing and resection, two point and three point problems.

**Contouring:** Characteristics of contours, contour interval, contour gradient, Methods of locating contours, uses of contour maps.

**Trigonometric Leveling:** Trigonometric leveling, Objects accessible and non accessible, Determination of levels object-when

**Field Astronomy:** Definitions of terminology used in Astronomy,

Introduction to Remote Sensing and GIS Estimation for quantities for various types of construction, Rate Analysis, Preparation of Tender & contract documents, Centre-line diagram, Building layout.

#### **4. Irrigation & Water Resources**

Definition, necessity, benefits, 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.

#### **5. Theory of Structures and Strength of Materials**

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.

Springs, Vibration

#### **6. Structural Analysis**

Introduction to Indeterminate structures, Degrees of freedom per node, Static and Kinematic indeterminacy (i.e. for beams, frames & portal with & without sway etc.), Releases in structures, Maxwell's reciprocal theorem and Betti's theorem, Analysis of Statically Indeterminate Structures using Slope-deflection method.

Analysis of structures using Moment - distribution method applied to continuous beams and portal frames with and without inclined members. Unit load method & their applications : deflection of determinate beams and frames, analysis of determinate and redundant frames up to two degree of redundancy, lack of fit in redundant frames.

### **7. Soil Mechanics and Foundations Engineering**

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, IS1 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.

### **8. Design of R.C. Concrete and Masonry Structures**

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).

### **9. Design of Steel Structures**

**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.

### **10. Construction Technology**

Stone and Brick Masonry: Ashlar, course and random rubble, stone pillar, dry stone and arch masonry, brick bonds and type of walls;

Lintels; Plastering, pointing, flooring, Expansion and construction joints; Centering and shuttering, General Selection criteria of site, Planning and orientation of buildings.

Roofing: Stone slab, RCC, G.C. Steel, Asbestos cement and jack arch roofing.

Flooring: Cement concrete, flag stone, terrazzo mosaic, Terrazzo tile, Brick on edge, timber Granolithic, linoleum and other floorings,

Plastering: Lime, cement sand, composite and rough coat plaster, Plaster of Paris, painting, Damp proof course, anti-termite treatment,

Centering and Shuttering: Centering form work, shuttering and moulds, timber & steel trestles and false work, scaffolding and shoring, under pinning

### **11. Auto -Cad Civil Engineering Drawing**

