22. कनिष्ठ अभियंता के उक्त पदों पर भर्ती हेतु परीक्षा की स्कीम एवं पाठ्यक्रम :– कनिष्ठ अभियंता के उक्त पदों पर सीधी भर्ती हेतु परीक्षा की स्कीम एवं पाठ्यक्रम निम्नानुसार है :–

(1) कनिष्ठ अभियन्ता (सिविल) (डिग्री) परीक्षा की स्कीम (Exam scheme)

प्रश्न–पत्र	अंक	अधिकतम अंक	समय
भाग–अः– सामान्य ज्ञान (राजस्थान का इतिहास, कला एवं संस्कृति, परम्पराऐं, विरासत एवं राजस्थान का भूगोल), राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था भाग–बः– सिविल अभियांत्रिकी (डिग्री)	40 80	120 अंक	2 घण्टे

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।
3. **किसी प्रश्न विशेष के गलत उत्तर के लिए परीक्षार्थी के प्राप्तांकों में से उस प्रश्न के पूर्णांक का एक–तिहाई अंक (1/3) अंक काटा जावेगा।**

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पाठ्यक्रम (Syllabus)

भाग–अ :–सामान्य ज्ञान

(राजस्थान का इतिहास, कला एवं संस्कृति, साहित्य, परम्पराऐं एवं विरासत)

1. राजस्थान के इतिहास के प्रमुख स्त्रोत
2. राजस्थान की प्रमुख प्रागैतिहासिक सभ्यताऐं
3. राजस्थान के प्रमुख राजवंश एवं उनकी उपलब्धियां
4. मुगल–राजपूत संबंध
5. स्थापत्य कला की प्रमुख विशेषताऐं
6. महत्वपूर्ण किले, स्मारक एवं संरचनायें
7. राजस्थान के धार्मिक आंदोलन एवं लोक देवी–देवताऐं
8. राजस्थान की प्रमुख चित्रकलाऐं, शैलियां एवं हस्तशिल्प
9. राजस्थानी भाषा एवं साहित्य की प्रमुख कृतियां, क्षेत्रीय बोलियां
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 संधियां, 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 विभागः– मरूस्थलीय 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 मुददे
9. मरूस्थलीकरण
10. कृषि–जलवायु प्रदेश एवं प्रमुख फसलें
11. पशुधन
12. बहुउद्देशीय परियोजनाऐं
13. सिंचाई परियोजनाऐं
14. जल संरक्षण

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15. परिवहन
16. खनिज सम्पदाऐं

राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था :–

1. राजस्थान में स्थानीय नगरीय स्वशासन
2. 74 वां संविधान संशोधन विधेयक
3. राज्यपाल, राजस्थान विधानसभा, मुख्यमंत्री, जिला प्रशासन, लोकायुक्त
4. राज्य मानवाधिकार आयोग
5. राज्य सूचना आयोग
6. राज्य निर्वाचन आयोग
7. राजस्थान लोक सेवा गारन्टी अधिनियम, 2011

भाग–बः–सिविल अभियांत्रिकी (डिग्री)

1. **Builiding Technology and Construction Management**

Building Materials: stones, bricks, stoel, 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: Course 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-center and met centric height experimental and analytical determination of met centric 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, stream lines, path lines, stream tubes, principles of conservation of mass, equation of continuity, acceleration of fluid particles local and connective, Rotational and irrational motions, free and forced vortex, circulation and voracity velocity potential and stream function, elementary treatment of flow net. Euler's equations of motion and integration of Euler's equations, Bernoulli's equation for in compressible Fluids, assumptions in Bernoulli's equation, Energy correction factor.

Applications for Bernoulli's equation: Pitot tube, Venturi meter, orifice meter, orifices & mouth pieces, time of emptying of tanks by orifices, sharp edged rectangular, triangular and trapezoidal notches, Francis formula. Velocity of approach. End contractions Cippoletti Weir, time of emptying reservoirs by weirs.

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

Flow Through Pipes: Laminar flow, Reynolds experiment, transition from laminar to turbulent flow. Turbulent Flow: Laws offluid friction, friction factor Moodys diagram, loss of head due to friction and other causes. Hydraulic gradient, total energy line Chezy'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, corrections to tape measurements. Field problems in distance measurements. Advance techniques of distance measurement.

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 theodolite in field problems.

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

Leveling: Definitions of various terms in leveling. Different types of leveling. Sources of error sin leveling curvature and refraction corrections. Temporary and permanent adjustment of dumpy and tilting levels. Computation and adjustment of level. 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 [illegible] of flood, Causes and effects, Methods of flood control, water logging, preventive [illegible] Land

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Designation : Secretary

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 ete.) 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, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permeability, determinations 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 Masonary 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)

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.

9. Design of Steel Structures

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.

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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

12. Public Health Engineering

Per capita requirement of water for urban areas, Forecast of population. Sources. Water supply standards of purity of public water supplies with various methods of purification; House drainage system Distribution network with all the ancillaries: system of drainage. Layout of sewerage systems. Primary, secondary treatments, trickling filters, lagoons and other treatment unit sand their design criteria. Flushing of sewers; sewage treatment; Urban water supply and sanitation.

13. Highway and Bridges

Principles of highway planning; classification of road land width, building line, center line, formation width, pavement width, Camber, longitudinal gradient sight distance, horizontal curve, super elevation, vertical curve, lateral and vertical clearances.

Flexible pavements; Sub-base, base course and shoulder stone / Kankar brick soling, WBM courses, shoulders. Granular sub-base, stabilized soil roads cement / lime stabilized sub base, sand bitumen base course, crushed cement concrete base/sub-base course. Prime and tack coats, surface dressing, open graded premix carpet, semi dense carpet, build-up spraygrout base course, bituminous base binder course. Asphaltic concrete, seal coats, mixed seal surfacing. Penetration macadam base/binder course, full and semi groups.

Traffic Engineering : traffic characteristics, road user characteristics, vehicular characteristics, volume, speed and delay studies origin and destination study, traffic flow characteristics, traffic capacity and parking studies, traffic regulation, traffic control devices, Intersection control.

Alignment: traffic engineering, pavement design, paving materials and highway construction and maintenance of different types of roads.

(2) कनिष्ठ अभियन्ता (सिविल) (डिप्लोमा) परीक्षा की स्कीम (Exam scheme)

प्रश्न–पत्र	अंक	अधिकतम अंक	समय
भाग–अः– सामान्य ज्ञान (राजस्थान का इतिहास, कला एवं संस्कृति, परम्पराऐं, विरासत एवं राजस्थान का भूगोल), राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था	40	120 अंक	2 घण्टे
भाग–बः– सिविल अभियांत्रिकी (डिप्लोमा)	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।
3. **किसी प्रश्न विशेष के गलत उत्तर के लिए परीक्षार्थी के प्राप्तांकों में से उस प्रश्न के पूर्णांक का एक–तिहाई अंक (1/3) अंक काटा जावेगा।**

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पाठ्यक्रम (Syllabus)

भाग–अ :–सामान्य ज्ञान

(राजस्थान का इतिहास, कला एवं संस्कृति, साहित्य, परम्पराऐं एवं विरासत)

1. राजस्थान के इतिहास के प्रमुख स्त्रोत
2. राजस्थान की प्रमुख प्रागैतिहासिक सभ्यताऐं
3. राजस्थान के प्रमुख राजवंश एवं उनकी उपलब्धियां
4. मुगल–राजपूत संबंध
5. स्थापत्य कला की प्रमुख विशेषताऐं
6. महत्वपूर्ण किले, स्मारक एवं संरचनायें
7. राजस्थान के धार्मिक आंदोलन एवं लोक देवी–देवताऐं
8. राजस्थान की प्रमुख चित्रकलाऐं, शैलियां एवं हस्तशिल्प
9. राजस्थानी भाषा एवं साहित्य की प्रमुख कृतियां, क्षेत्रीय बोलियां
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 संधियां, 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 विभागः– मरूस्थलीय 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 मुददे
9. मरूस्थलीकरण
10. कृषि–जलवायु प्रदेश एवं प्रमुख फसलें

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11. पशुधन
12. बहुउद्देशीय परियोजनाऐं
13. सिंचाई परियोजनाऐं
14. जल संरक्षण
15. परिवहन
16. खनिज सम्पदाऐं

राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था :–

1. राजस्थान में स्थानीय नगरीय स्वशासन
2. 74 वां संविधान संशोधन विधेयक
3. राज्यपाल, राजस्थान विधानसभा, मुख्यमंत्री, जिला प्रशासन, लोकायुक्त
4. राज्य मानवाधिकार आयोग
5. राज्य सूचना आयोग
6. राज्य निर्वाचन आयोग
7. राजस्थान लोक सेवा गारन्टी अधिनियम, 2011

भाग–बः–सिविल अभियांत्रिकी (डिप्लोमा)

1.**Building Technology And Construction Management**

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.

2. **Surveying, Estimating & Costing**

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, Leveling. Definition of terms used in leveling, 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. Estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work earthwork, Brickwork (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.

3. **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.

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4. **Reinforced Concrete 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).

5. **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.

6. **Soil 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, 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, Tri-axial 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.

7. **Auto- Cad Civil Engineering Drawing**

(3) कनिष्ठ अभियन्ता (यांत्रिक/विद्युत) (डिप्लोमा) परीक्षा की स्कीम (Exam scheme)

प्रश्न–पत्र	अंक	अधिकतम अंक	समय
भाग–अः– सामान्य ज्ञान (राजस्थान का इतिहास, कला एवं संस्कृति, परम्पराऐं, विरासत एवं राजस्थान का भूगोल), राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था	40	120 अंक	2 घण्टे
भाग–बः– यांत्रिक/विद्युत अभियांत्रिकी (डिप्लोमा)	80		

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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।
3. **किसी प्रश्न विशेष के गलत उत्तर के लिए परीक्षार्थी के प्राप्तांकों में से उस प्रश्न के पूर्णांक का एक–तिहाई अंक (1/3) अंक काटा जावेगा।**

पाठ्यक्रम (Syllabus)

भाग–अ :–सामान्य ज्ञान

(राजस्थान का इतिहास, कला एवं संस्कृति, साहित्य, परम्पराऐं एवं विरासत)

1. राजस्थान के इतिहास के प्रमुख स्त्रोत
2. राजस्थान की प्रमुख प्रागैतिहासिक सभ्यताऐं
3. राजस्थान के प्रमुख राजवंश एवं उनकी उपलब्धियां
4. मुगल–राजपूत संबंध
5. स्थापत्य कला की प्रमुख विशेषताऐं
6. महत्वपूर्ण किले, स्मारक एवं संरचनायें
7. राजस्थान के धार्मिक आंदोलन एवं लोक देवी–देवताऐं
8. राजस्थान की प्रमुख चित्रकलाऐं, शैलियां एवं हस्तशिल्प
9. राजस्थानी भाषा एवं साहित्य की प्रमुख कृतियां, क्षेत्रीय बोलियां
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 संधियां, 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 विभागः– मरूस्थलीय 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 मुददे
9. मरूस्थलीकरण

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10. कृषि–जलवायु प्रदेश एवं प्रमुख फसलें
11. पशुधन
12. बहुउद्देशीय परियोजनाऐं
13. सिंचाई परियोजनाऐं
14. जल संरक्षण
15. परिवहन
16. खनिज सम्पदाऐं

राजस्थान की राजनीतिक एवं प्रशासनिक व्यवस्था :–

1. राजस्थान में स्थानीय नगरीय स्वशासन
2. 74 वां संविधान संशोधन विधेयक
3. राज्यपाल, राजस्थान विधानसभा, मुख्यमंत्री, जिला प्रशासन, लोकायुक्त
4. राज्य मानवाधिकार आयोग
5. राज्य सूचना आयोग
6. राज्य निर्वाचन आयोग
7. राजस्थान लोक सेवा गारन्टी अधिनियम, 2011

भाग–ब:– विद्युत अभियांत्रिकी (डिप्लोमा)

1. BASIC CONCEPT:

Concepts of resistance, inductance, capacitance and various factors affecting them. Concepts of current, voltage, power, energy & their units.

2. CIRCUITS LAW

Kirchoff's law, simple circuit solution using network theorems.

3. MAGNETIC CIRCUITS

Concepts of flux, mmf, reluctance, different kind of magnetic materials. Magnetic calculations of conductors of different configuration eg straight circular, solenoidal etc. Electromagnetic induction, self and mutual Indution.

4. AC FUNDAMENTAL:

Instantaneous, peak R.M.S. and average values of alternating waves, Representation of sinusoidal wave from, simple series & Parallel AC circuits consisting of R.L and C.
Resonance, Tank circuits. Poly system star & delta connection, 3 Phase power, DC and sinusoidal response of R-L and R-C circuit

5. MEASUREMENT & MEASURING INSTRUMENTS:

Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 altmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving coil and moving iron type), extension of range wattmeter. Multimeter, Meggar, Energy meter AC Bridges. use of CRO, Signal Generator, CT, PT and their uses. Earth fault detection.

6. ELECTRICAL MACHINES:

(a) D.C. Machine: Constructions, Basic Principals of D.C, Motors & Generations, their characterics, Speed control and starting of D.C motors. Method of braking motor. Losses and efficiency of D.C. Machine.

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(b) 1 phase and 3 phase transformers- constructions, principals of operation, equivalent circuits, voltage regulations, 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 transforms. Auto transformers.

(c) 3 Phase inductions motors, rotating magnetic field, principal of operation, equivalent circuit torque - speed characteristics starting and speed control of 3 phase induction motors Methods of braking. effects of voltage and frequency variation on torque speed characteristics.

Fractional kilowatt Motors and Signal Phase Inductions Motors: Characteristics and application.

7. SYNCHRONOUS MACHINES

Generation of 3-phase e.m.f. armature reaction, Voltage regulation, Parallel operation of two alternator, synchronizing, control of active and reactive power, starting and applications of synchronous motors.

8. 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 circuits current for symmetrical faults. Switchgears - rating of circuits breaker, Principles of are extinction by oil and air, H.R.C. Fuses, Protection against earth leakage/ over current, etc. Buchholtz relay, Merz- Price system of protection of generator & transformers, protection of feeders and bus bars. Lighting arresters, various transmission and distribution system, comparisons of conductor materials, efficiency of different system.

Cable-Different type of cables, cable rating and derating factor.

9. ESTIMATION AND COSTING

Estimation of lighting scheme: electric installation of machines and relevant IE rules, Earthing practices and IE Rules.

10. UTILIZATION OF ELECTRICAL ENERGY

Illumination, Electric heating, Electric welding, Electroplating. Electric drives and motors.

11. BASIC ELECTRONICS

Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type). BJT and JFET: Simple circuits using these devices.

भाग-ब:- यांत्रिक अभियांत्रिकी (डिप्लोमा

1. Fluid Mechanics

Properties & Classification of Fluid: ideal & real fluids, Newton's law of viscosity, Newtonian and Non-Newtonian fluids, compressible and incompressible fluids.

Fluid Statics: Pressure at a point.

Measurement of Fluid Pressure : Manometers, U-tube, Inclined tube.

Fluid Kinematics: Stream line, laminar & turbulent flow, external & internal flow, continuity equation.

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Hydro dynamics and Measurement of Flow: Bernoulli's equation, Total head; Velocity head; Pressure head; Application of Bernoulli's equitation. Venturi meter, Pilot tube, Orifice meter.

Impact of free jet Flow through pipes, orifices.

2. Fluid Machine

Hydraulic Turbines: Classifications, Principles.

Centrifugal Pumps: Classifications, Principles, Performance

Reciprocating Pump: Types, main components, principles

Miscellaneous Hydraulic Machines: Hydraulic accumulator, Hydraulic intensifier, Hydraulic press, Hydraulic coupling and torque converter

3. Internal Combustion Engines

Principles of Internal Combustion Engines:

Introduction and Classification of I.C. Engines

Working principle of four stroke and two stroke cycle and their comparison

Working and special features of petrol and diesel engines and their comparison and applications

I.C. engine terms-Bore, stroke, dead centre, crank throw, compression ratio, clearance volume, piston displacement and piston speed

Valve timing diagrams (Theoretical & Actual), firing order

Super charging of I.C. engines

Petrol Engines:

Concept of Carburetion, Air fuel ratio

Simple carburetors and its limitations

Description of Solex carburetors

Multi point fuel injection system

Mechanical and electrical feed pump

Description of coil ignition system and Magneto ignition system

Diesel Engines:

Description and working of Fuel feed pump

Injection of fuel, air and air less injection and fuel injectors

Introduction to swir land open combustion chambers

Cooling, Lubrication and Governing:

Necessity of engine cooling

Properties of coolants

Methods of cooling and their merits and demerits

Function of Lubrication, lubrication systems of I.C. Engines

Properties of lubricants

Governing methods of I.C. Engines.

I.C. Engines Performance:

Introduction to basic performance parameters

Measurement of brake power by rope brake, prony brake and hydraulic dynamometer Measurement of Indicated power by engine indicator and Morsetest method.

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Energy balance sheet of I.C. engine sand finding various efficiencies Numerical problems

Gas Turbines (No numerical problem):

Classification and application of gas turbines

Description of constant pressure (open cycle and closed cycle) and constant volume gas turbines.

Methods of increasing thermal efficiency of gas turbines, regeneration, inter cooling, re-heating.

Air Compressors (No numerical problem):

Classification of compressors, uses of compressed air

Description of single stage and multistage reciprocating compressors

P.V. diagram of single and multi stage reciprocating compressor with inter cooling.

Description of rotary and centrifugal compressors

4. Strength of Materials

Simple Stress and Strain:

Various mechanical properties

Concept of stress and strain

Hook's law

Working stress and factor of safety

Stress and strain calculations

Temperature stresses

Shear stresses

Poisson's ratio and volumetric strain

Relationship between elastic constants

Compound Stress:

Stress components on an inclined plane

Mohr's circle:

Principal stresses and planes

Strain Energy:

Strain energy from stress-strain diagram

Proof resilience

Types of loading-gradual, sudden, impact

Bending Moment sand Shear Force:

Basic concept, Types of support, Types of beam, Types of load

Shear force and bending moment

Bending moment and shear force diagrams (for point loads, U.D.L. and their combinations)

Moment of Inertia:

Concept of moment of Inertia

Radius of gyration

Moment of Inertia of various section

Moment of inertia of unsymmetrical section like: T-section, channel section, L-section etc.

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Bending Stresses in Beams:

Concept of bending stress

Theory of simple bending

Design criterion and section modulus

Shear Stress in Beams:

Concept

Shear stress distribution diagram of various sections

Deflection:

Concept of deflection of a beam

Use of standard formula for calculating deflection (for point loads, U.D.L. and their combination)

Columns and Struts:

Concept of column and struts

Modes of failure

Types of column; long and short

Buckling loads

Slenderness ratio

Euler's formula (without proof)

Rankine's formula

Torsion of Shaft:

Concept of torsion, Relation between power and torque, Combined stress due to bending and torsion in solid and hollow shaft

Springs:

Introduction and classification of springs, Flat carriage springs, Close lycoiled helical springs

Thin Cylindrical Shells:

Use of cylinders, Stresses due to internal pressure, Design of thin cylinders-calculation of the various dimensions of a thin cylinder

Combined Direct and Bending Stress:

Effect of eccentricity, Stress due to eccentric load, Middle third rule, Quarter rule

5. Theory of Machines

Simple Mechanism:

Introduction to link, kinematic pair, kinematic chain, structure, mechanism, machine

Slider crank mechanism and its inversion

Double slider crank chain.

Example of mechanism with higher pairs

Velocity and Acceleration in Mechanism:

Velocity diagrams of four bar and single slider crank mechanisms by relative velocity

method and instantaneous centre method

Acceleration diagram off our bar chain and reciprocating engine mechanism, coriolis components

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Dynamics of Reciprocating Parts:

Analytical method for velocity and acceleration of piston
Piston effort, crank pin effort, turning moment diagrams
Fluctuation of energy and speed, Energy of a fly wheel
Calculating the weight of fly wheel.

Friction:

Friction of collars and pivots, Friction clutches-plate clutch and centrifugal clutch, Friction. in journal bearings, Rolling friction

Transmission of Power:

Flat and V-belt drives
Velocity ratio of belt drives, slip in belt, and creep in belt..
Length of open and cross belt drives
Power transmitted by a belt
Ratio of driving tension, centrifugal tension, Condition for the maximum power transmission, initial tension in the belt.
Chain drives-types of chain drives roller chain and inverted tooth chain.
Gear drives-Types of gear wheels, proportions of gear tooth
Gear trains-Simple gear train, compound gear train, reverted gear train and simple epicyclical gear train.

Balancing:

Static and dynamic balancing, need of balancing
Balancing of single rotating mass by a single mass in the same plane, by two masses rotating in different planes.
Partial primary balancing of a single cylinder reciprocating engine

Vibration:

Causes of vibrations in machine, their effects and method of reducing them
Free or natural vibration
Forced vibration
Damped vibration.

Governors (No derivation & numerical):

Introduction and classification.
Methods of governing (Quality. Quantity and hit and miss governing)
Dead wt governors (watt, porter and prowl)
Spring control governors (hart Nell and Wilson hart Nell).
Concept of sensitivity, stability, isochronisms, hunting, effort and power.

Brakes and Dynamometer:

Introduction, function, capacity of brakes:
Block and shoe brake
Band brake
Internal expanding brake
Functions of dynamometer, Prony-brake, Rope brake and Froude's hydraulic dynamometer.
Gyroscope-Introduction and principle, Gyroscopic couple

6. <u>Auto Cad -Mechanical Engineering drawings</u>

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Machining Symbols and Tolerances:

Introduction of limits, fits, tolerances.
Machining symbol
Tolerancing

Working Drawing:

Piston and Connecting rod
Crankshaft
Bush bearing, ball bearing and roller bearing
Lathe spindle

Assembly Drawing:

Drilling jigs, milling jigs
Stepped pulley, fast and loose pulley, V-belt pulley,
Foot step bearing, Plummer block and Universal coupling
Lathe tail stock and Shaper tool head
Fuel injector and Fuel injection pump (jerk type)
Machine vice and screw jack

Gear tooth profile

Gear types and gear nomenclature (spur, helical and bevel gears)
Drawing in volute tooth profile (spur gear only) by- Approximate method
Prof. Unwin's method

Cam profile

Types of cams and followers
Types of follower motions
Construction of disc cam profile with knife edge follower

Computer Graphics:

Application software:-Introduction of CAD and similar software, application like CATIA, Pro/Engineer and other, Getting Started-I, Getting Started-II, Draw Commands, Editing Commands, Drawing Aids, Creating Text, Basic Dimensioning. Inquiry Commands, Editing Dimensions, Hatching, Blocks, Plotting Drawings in Auto CAD, Draw isometric views of simple objects. Introduction of 3D modeling. Wire frame and surface modeling

7. Thermo Dynamics

Basic Concept and Gas Laws:

Thermodynamics, property-Intensive and Extensive system-open, closed and isolated

Energy-Internal energy, potential energy, kinetic energy, heat, work, specific heat, enthalpy, Boyle's law, Charle's law, Joule's law, Characteristics gas equation, gas constant, mol, universal gas constant and molar specific heats, Simple numerical problems

Laws of Thermo dynamics:

Zeroth law of thermo dynamics
First law of thermo dynamics.
Second law of thermo dynamics Concept of entropy
Constant volume, constant pressure, isothermal, adiabatic poly tropic processes, throttling and free expansion, work done during these processes.

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Simple numerical problems

Availability:

Available and unavailable energy.

Effectiveness

Irreversibility inflow and non-flow process.

Formation of Steam and its Properties:

Generation of steam at constant pressure, various stage of steam-wet steam, dry steam saturated steam, dryness fraction, super heated steam, degree of superheat. Critical point, triple point, thermo dynamic properties of steam-specific volume, specific enthalpy, specific internal energy, specific entropy.

Steam property diagram: temperature-entropy diagram, enthalpy-entropy diagram, pressure-enthalpy diagram

Heating and expansion of steam during thermo dynamic processes, Change of internal energy and entropy of steam during processes.

Simple numerical problems. Use of steam tables and Mollier charts.

Steam Generators:

Definition of boiler according to I.B.R., classification of boilers, Comparison of water tube and fire tube boilers.

Special characteristics of high-pressure boilers

Introduction to Indian Boiler Act.

Boiler Performance:

Actual evaporation, Equivalent evaporation, Factor of evaporation, Boiler efficiency

Heat losses in boiler plants, Boiler power, Energy balance sheet of boiler.

Simple numerical problems

Gas Power Cycles:

Otto cycle, Diesel cycle, Dual combustion cycle, Atkinson cycle, Joule/ Bray ton cycle, Air standard efficiency

Effect of compression ratio on efficiency

8. Machine Drawings

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बोर्ड द्वारा आयोजित की जाने वाली सभी वस्तुनिष्ठ परीक्षाओं में किसी प्रश्न का उत्तर नहीं दिये जाने के संबंध में अभ्यर्थी से पुष्टि करवाये जाने हेतु ओ.एम.आर. उत्तरपत्रक में पाँचवा विकल्प के संबंध में निम्नलिखित विशेष निर्देश लागू किये गये है :–

1. प्रत्येक प्रश्न के 05 विकल्प **A, B, C, D, E.** अंकित रहेगें। उनमें से अभ्यर्थी को केवल एक विकल्प को नीले बॉल पेन से गहरा गोल उत्तरपुस्तिका में सही उत्तर दर्शाने हेतु करना होगा।
   Each question has five options marked as A, B, C, D, E. You have to darken only one circle (bubble) indicating the correct answer on the Answer Sheet using BLUE BALL POINT PEN.
2. प्रत्येक प्रश्न के लिये विकल्पों में से केवल एक विकल्प को भरना आवश्यक होगा।
   It is mandatory to fill only one of the options for each question.
3. यदि अभ्यर्थी द्वारा किसी प्रश्न को हल नहीं किया है तो उसके लिये पाँचवा विकल्प **E** को गोला गहरा करना होगा। यदि पाँचों विकल्पों में से किसी को भी गहरा नहीं किया जाता है तो ऐसे 10 प्रतिशत प्रश्नों तक प्रत्येक प्रश्न के 1/3 अंक घटाये जावेगें।
   If you are not attempting a question then you have to darken the circle 'E'. If none of the five circles is darkend, one third (1/3) part of the marks of question shall be deducted.

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