

**SCHEME & SYLLABUS OF EXAMINATION OF PART-I FOR POST NO. 3**

**ASSISTANT SITE ENGINEER (CIVIL)**

<b>Part</b>	<b>Section</b>	<b>Subject/Syllabus</b>	<b>No. of questions</b>	<b>Maximum Marks</b>	<b>Qualifying Marks</b>
			<b>60</b>	<b>180</b>	<b>72</b>
Part-I	Section 'A'	Reasoning/Quantitative Aptitude	20	60	
	Section 'B'	<ul style="list-style-type: none"><li>• <b>General Knowledge &amp; General Knowledge of Rajasthan:</b><ol style="list-style-type: none"><li>1. Events of State, National and International importance</li><li>2. Geography and Natural Resources of India and Rajasthan</li><li>3. Agricultural, Social and economic development of India Rajasthan</li><li>4. Indian Medieval History, Indian struggle for Independence,, and History of Rajasthan</li><li>5. Culture and heritage of India and Rajasthan</li></ol></li><li>• <b>General Science:</b><ol style="list-style-type: none"><li>1. Elements, Mixtures and Compounds</li><li>2. Physical and Chemical Changes; Oxidation and Reduction: Catalysis</li><li>3. Metals and Non Metals</li><li>4. Acids, bases and Salts</li></ol></li></ul>	30	90	

		<ol style="list-style-type: none"> <li>5. Reflection of light and its laws, lenses, human eye, defects of vision and its correction</li> <li>6. Electric current, Electric potential, Ohms law , electric cell and Electric motor</li> <li>7. Human Brain, hormones, human diseases and cure</li> <li>8. Economic importance of animals and plants</li> <li>9. Biomass, sources of energy, ecosystem, Mendel's Law of inheritance, chromosomes</li> <li>10. Human blood groups, blood transfusion, Deficiency diseases and cure</li> </ol> <ul style="list-style-type: none"> <li>• <b>Basic Computer Skills:</b> <ol style="list-style-type: none"> <li>1. Introduction to Computers</li> <li>2. Computer Systems</li> <li>3. Uses of Computers</li> <li>4. Introduction to the Internet &amp; Search Engines, Internet Applications</li> <li>5. Operating system,</li> <li>6. MS Word Advance</li> <li>7. Database Management System</li> <li>8. MS Excel Advance</li> <li>9. MS Power Point Basics</li> <li>10. Microsoft Outlook-Basics</li> </ol> </li> </ul>			
	Section 'C'	<b>Language Comprehension</b> <ul style="list-style-type: none"> <li>• <b>Hindi</b> <ol style="list-style-type: none"> <li>1. शब्द रचना: संधि एवं संधि विच्छेद, समास, उपसर्ग, प्रत्यय</li> </ol> </li> </ul>	10	30	

		<p>2. शब्द प्रकार: तत्सम, तत्भव, अर्धतत्सम, देशज, विदेशी, संज्ञा, सर्वनाम, विशेषण, क्रिया, अव्यय</p> <p>3. शब्द ज्ञान: पर्यायवाची, विलोम, शब्द युग्मो का अर्थभेद, वाक्यांश के लिए सार्थक शब्द, संश्रुततभिन्नार्थक शब्द, समानार्थी शब्द, उपयुक्त शब्द चयन, संबंधवाची शब्दावली</p> <p>4. शब्द शुद्धि</p> <p>5. व्याकरणिक कोटियाँ: परसर्ग, लिंग, वचन, पुरुष, काल, वृत्ति, पक्ष , वाच्य</p> <p>6. वाक्य रचना</p> <p>7. वाक्य शुद्धि</p> <p>8. विराम चिन्हो का प्रयोग</p> <p>9. मुहावरे/ लोककित्या</p> <p>10. पारिभाषिक शब्दावली: प्रशासनिक/ विविध</p> <p>• <b>English</b></p> <p>1. Use of articles and determiners</p> <p>2. Tenses/ sequence of tenses</p> <p>3. Active and passive voice</p> <p>4. Direct and Indirect Narration</p> <p>5. Use of Prepositions</p> <p>6. Synonyms and antonyms</p> <p>7. Comprehension of passage</p> <p>8. Idioms and Phrases</p> <p>9. Letter writing: Official, Demi-official. Circulars and Notices</p>			
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### **POST NO 3. ASSISTANT SITE ENGINEER (CIVIL)**

#### **SCHEME & SYLLABUS OF EXAMINATION OF PART-II**

<b>Part</b>	<b>Section</b>	<b>Subject</b>	<b>No. of Questions</b>		<b>Maximum Marks</b>	
Part-II	Section 'A'	<b>Transport and Traffic Engineering</b>	90	30	270	90
	Section 'B'	Water Supply, Sanitary Engineering & Environmental Engineering		15		45
	Section 'C'	Estimation and Construction Material		15		45
	Section 'D'	1. Strength of Materials 2. Soil and Foundation Engineering 3. Theory of Structure 4. Structural Design-I 5. Structural Design-II 6. Fluid Mechanics 7. Surveying		30		90

#### **Section 'A'**

TRANSPORT AND TRAFFIC ENGINEERING: Survey investigation and preparation of road project. Highway standard classification, land width, building line center line, formation width, terrain classification, pavement width Camber longitudinal gradients, sight distance horizontal curve, super elevation, vertical curve, lateral and vertical clearances.

Design of Pavement: Flexible pavements.

Pavement Construction: Sub-base, base course and shoulder stone/kankar bricks 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.

Bituminous Course: Prime and tack coats, surface dressing, open graded premix carpet, semi dense carpet, built-up spray grout base course, bituminous base binder course. Asphaltic concrete seal coats, mixed seal surfacing, Penetration macadam base/binder course, full and semi grouts.

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. System approach in traffic management.

Bridge Engineering: Components of bridges, classification of bridges, requirements of an ideal bridge, selection of bridge site, Bridge alignment, site investigation and collection of data, waterway of bridges. Economics span scour depth of foundation, Afflux. Clearance, free board. Type of bridge superstructures and methods of erection, bridge bearings, joints in bridge, wearing coat, Railing, parapet and approach slab.

Type of bridge foundation, bridge pier, adjustment and wing walls. Training work for bridges and protection works. Low cost bridges, causeway, timber bridges, suspension bridges, pipe and slab culverts.

## **Section 'B'**

WATER SUPPLY: Water Supply Engineering: Quantitative requirements of water supply for urban and rural areas. Variation in demand. Forecast of population. Different sources of water supply, lakes. rivers and ground water. Intake arrangements. Drinking water standard for water. Bacteriological test. Pumping of raw water. Design of rising mains. Water treatment, flow diagram, sedimentation coagulation, filtration and disinfection, water softening and aeration of water. Water distribution system

and their design and analysis. Clear water reservoirs. Rural water supply and sanitation. Problems of low-cost potable water for rural population. Tube wells for water supply. Safe yield from tube wells.

**SANITARY ENGINEERING:** sewerage, separate sewers and combined sewers. Hydraulic and structural design considerations. Different types of pipe material and different shapes of build up sewers. Superimposed load in sewers. House plumbing, various accessories and arrangement. Sewage pumping station.

Characterization of Sewage: Physical, chemical and biological analysis, Industrial waste water and its problems, natural purification process through soil mass and through water bodies self-purification of streams. Sewage treatment, Physical treatment, screening, skimming tanks, Grit chamber, settling tanks. Secondary (biological) treatment, trickling filters and high rate bio filters. Activated sludge and accelerated aeration plants. Secondary, settling tanks, sludge digesters and sludge drying. Final disposal, Low cost waste water treatment oxidation ponds, oxidation ditches, aerated lagoons, septic tank, anaerobic lagoons. Dry refuse disposal. Basic concepts of Urban and Rural sanitation.

**ENVIRONMENTAL ENGINEERING:**

Water/Waste Water/Industrial Waste Water Engineering: Unit processes/Operations related to water and waste water treatment, namely Equalization Coagulation; Flocculation; Settling; filtration; Disinfection; Aeration; Adsorption etc.

Physical, chemical and biological characteristics of water and Sewage; Activated sludge process and its modifications; treatment ponds and aerated lagoons; Trickling filters; Rotating biological contactors; Sequencing Batch reactor and Membrane Batch Reactor

Anaerobic digestion; Anaerobic filter and UASB, Nitrification & De-nitrification. Characteristics and treatment of waste from Textile, Tannery, Dairy, Distillery, Cement Industry

Air and Noise Pollution: Sources of air pollution; Properties of air pollutants; Meteorological factors influencing dispersion of air pollutants; Gaussian plume model for dispersion of air pollutants and its

applications, Effects on human health. Control technology for particulate and gaseous pollutants from industries. Air pollution due to Automobiles and emission control;

Basics of noise pollution, Measurement and management of noise. Permissible noise levels in different zones, Effects of noise on human beings, Ambient Air Quality standards & Air Quality Index.

Environmental Impact Assessment/ Environmental Legislations in India: Basic concept of Environmental Impact Assessment, Environmental Impact Statement and Environment Management Plan; Prediction and assessment of impacts on air, water, biota, noise, cultural and socioeconomic environment; Rapid and comprehensive Environmental Impact Assessment. Environment (Protection) Act 1986, its amendments and various rules /notification made therein. Water (Prevention & Control of Pollution) Act, 1974, Air (Prevention & Control of Pollution) Act, 1981.

Common understanding of environmental clearance processes, NGT Act, Pollution Indices, Environmental laws – various notifications , their interpretations and implementation.

Municipal Solid, Biomedical, e-waste, plastic waste and Hazardous solid Waste Problems associated with solid Waste viz; municipal, biomedical, hazardous, e-waste, plastic waste etc., its generation; classification; characterization; analysis; Onsite Collection Handling, storage Transport and Processing of solid waste; Recovery of Resources, Conversion Products and Energy generation from solid waste. Hazardous waste definition; Risk associated with hazardous waste & its Assessment; Waste Minimization; Priorities in hazardous waste management; hazardous waste treatment.

## **Section 'C'**

### **ESTIMATION AND CONSTRUCTION MATERIALS:**

Cost Specification & estimation of Road works, Buildings works, water supply works, Irrigation works including valuation for per standard norms.

- (i) Building Materials : building stones, building bricks, steel (Plain, Tor, High-tensile and Structural), Timber, lime, cement, sand, surkhi, cinder, stone slabs and lintels, aggregates for cement concrete, paints, distempers, use of pozzolana manufacturing of line concrete, cement concrete for plan reinforced and pre-stressed concrete work.
- (ii) 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.
- (iii) Constructions Stone Masonry: Ashlar, course rubble, random rubble, stone pillar, dry stone and arch masonry.

Bricks Masonry: Types and their uses hollow and reinforced brick work.

Wood Work: doors and windows.

Steel Work: Structural steel work, metal doors and windows.

Roofing: Stone slab roofing, G.C. Steel sheet roofing, Asbestos cement sheet roofing, jack arch roofing, tile and thatch roofing.

Flooring: Cement concrete flooring, flag stone flooring, terrazzo mosaic flooring, Terrazzo file flooring, Brick on edge flooring, timber Granolithic floor finish, linoleum and other floorings.

Plastering: Lime plaster, cement sand plaster, composite plaster, rough coat plaster, Arish plastering with Gypsum, Plaster of Paris, painting.

Miscellaneous: Damp proof course, anti-termite treatment, sill, coping and corbelling.

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

Sanitary and Water Supply: Providing and laying galvanized iron PVC, asbestos cement, stone ware, cast iron and RCC pipes; sewerage and drainage system; overhead and underground tanks; manholes



and gully chambers; septic tank; soak pit, dispersion trench, floor and wall treatment in toilets, glazed tile work, downpour pipes.

Construction Management: Management of construction, plants and equipment's. Planning for construction using network analysis C.P.M. and PERT techniques.

Shallow foundation: spread foundation, combined footing and strap footing, Mat of Raft Footing.

### **Section 'D'**

1. STRENGTH OF MATERIALS: Behavior of engineering materials in tension, compression and shear, elastic limit, yield stress, proof stress, nominal stress, actual stress and ultimate stress, factor of safety, load factor and elastic constants, Principal stresses and strains, Strain energy, theories of elastic failure.

Bending moment and shear force in statically determinate beams, stress due to bending moment and shear force, design of section, section modulus, elementary theory of torsion, combined bending and torsion, Forces in statically determinate plane trusses.

Slope and deflection of statically determinate beams, deflection of statically determinate frames Buckling of columns. Euler's Rankine's and secant formulae. Combined, direct and bending stresses for short columns. Thin cylindrical and spherical shells.

2. SOIL AND FOUNDATION ENGINEERING: Soil Exploration: Methods of site exploration, boring, sampling, standard penetrations test.

Preliminary definitions and relationship: Water content unit weight, specific gravity, void ratio, porosity and degree of saturation, density index, phase relationship.

Index Properties: Specific gravity, particle size distribution, consistency of soils. Classifications of soils, field identification.

Laboratory test: Particle size analysis, liquid limit, plastic limit, proctor density, field density, permeability, shear box and unconfined.

Soil water: inter-granular and pore water pressure, Quick sand phenomenon, permeability, Flow not and its uses.

Vertical pressure distribution: Bossiness's equations, Circular load, pressure bulb and its significance, New-mark's chart. Contact pressure distribution.

Consolidation: Concept of one-dimensional consolidation. Laboratory consolidation test, over-consolidated normally consolidated soils, settlement analysis.

Shear Strength: Basic concept, Mohr-Coulomb Failure theory and measurement of shear strength.

Earth Pressure: Lateral earth pressures (Active and Passive), Rankin's and Coulomb's theory.

Stability of slopes: Methods of slices, friction circle method, Taylor's method.

Bearing Capacity: Definitions, Terzaghi's method, general shear and local shear failures, plate load test.

Compaction: Field Compaction method, water content, field compaction control and factors affecting compaction. Pile Foundation: Types of Piles, driving of piles, load carrying capacity of piles, pile load testing, under-reamed pile foundation, bored compaction piles.

Well Foundations: Caissons, shapes of wells and component parts depth of well foundation and bearing capacity, forces acting on a well foundation on a well foundation. Well sinking.

3. THEORY OF STRUCTURES: Statically indeterminate Structures: Static and kinematics indeterminacy, Energy theorems, Stiffness and flexibility methods elementary analysis of structures, methods off consistent deformation, slope deflection and moment distribution. Analysis of beams (including continuous) and portal frames, Influence lines, Influence lines for moment, shear and

reaction for statically determinate beams and planar trusses. Muller-Breslau Principle and influence lines for indeterminate beams, rolling loads on beams-shear force and bending moment due to concentrated loads, uniformly distributed loads-shorter and longer than span.

4. STRUCTURAL DESIGN-I: Loads: Specifications for loads on buildings and bridges. Reinforce cement concrete: Limit state theory, resistance to bending, shear and bond. Design of singly and doubly reinforced beams, one way, two way and flat slabs, columns with axial; and uniaxial moment loading, footing, cantilever and counterfort retaining walls, simple underground and elevated reservoirs, cantilever sheds, simple rectangular portal frames, spherical domes, staircase.

Pre-stressed Concrete: Properties of high-grade concrete and high tensile steel, pre-tensioning and post tensioning losses in pre stress. Analysis and design of rectangular beams and slab.

5. STRUCTURAL DESIGN-II: Steel structures: Tension and compression members, single and built up sections, connection and splices, roof trusses, simple beams and Purlin connections, columns, lacing and batten, Grillage, Gusseted and slab base foundation. Plate and gantry girders, through and deck type plate girder bridges and with lateral bracings.
6. FLUID MECHANICS: Fluid properties, types of flow, Fluid statics, forces on fully and partially submerged bodies, stability of floating bodies, Fluid kinematics, acceleration of fluid particle, velocity potential and stream function, irrotational flows, ideal fluid flow, Bernoulli's Navier Stokes, Reynold's equation, application: Flow measuring devices.

Momentum and angular momentum principles as applied to fluid in a control volume, application to jets. Introduction of viscous flow, concept of drag. Flow through pipes, Laminar and turbulent. Equations for boundary layer thickness and boundary shear over flat plates. Channel Flows (GVF and RVF), surges. Dimensional analysis and similitude techniques.

7. SURVEYING: Distance Measurements: Use of steel and metallic tapes, application of corrections, measurement of base line, errors in base line measurements, reduction to mean sea level, specifications for base line measurements, optical measurements of distances, use of substance bars.

Angle Measurements: Principles of theodolite constrictions, temporary and permanent adjustment, precision in relation to nature of work, compass, varieties, limitations. Traverse adjustments.

Vertical Measurements: Use of leveling instruments of level, level tubes, estimation of sensitivity, optics, care and maintenance, parameters to define quality of telescope, leveling instruments and theodolites, methods of records and reducing, stadia reductions, use of level rods, contouring, drainage and watershed lines.

Methods of filling in details: Chain and compass, plane table and traverse surveys. Principles and adjustments of closed traverse, determination of missing data, solution of two point and three-point problems.

Other Surveys: Curve ranging using linear and angular measurements, simple compound and spiral curves.

Measurements of area and volumes: Use of Planimeter, measurements of areas and volumes including prismoidal, trapezoidal and Simpson's method.