



# ALL INDIA INSTITUTE OF MEDICAL SCIENCES, JODHPUR

Dated: 16<sup>th</sup> November, 2016

## **Information Brochure for Selection procedure for recruitment of Assistant Engineer (Civil) on Direct Recruitment Basis.**

1. Selection for the post of Assistant Engineer (Civil) on Direct Recruitment Basis at AIIMS, Jodhpur will be done through written examination.
2. The written Examination for the post of Assistant Engineer (Civil) will be held on 04<sup>th</sup> December, 2016 (Part A - 09:00am - 12:00am and Part B - 02:00pm - 05:00pm) at AIIMS, Jodhpur. Candidates should report with admit card and original Govt. issued valid ID proof on 04<sup>th</sup> December, 2016 at 08:00am sharp.
3. Admit card to eligible and provisionally eligible candidates for written exam will be available online from 17<sup>th</sup> November, 2016 and same will also be sent through speed post on correspondence address. In case the hardcopy of admit card is not received, the applicant can download the admit card from AIIMS, Jodhpur official website i.e. [www.aiimsjodhpur.edu.in](http://www.aiimsjodhpur.edu.in).
4. The Examination shall be in two parts, namely Part A and Part B. Part A will be used for screening, and Part B for determining the Merit list for Recruitment. Marks of Part A examination will not be counted for preparing the merit list; only marks of Part B will be counted for preparing the merit list.
5. Both Part A examination and Part B examination will be of 100 marks each.
6. Part A examination will consist of thought base 100 *Multiple Choice Questions* of thought type.
7. 15 times the number of the posts of each level and/for each category will be shortlisted from Part A. The Part B of the answer scripts will be evaluated only of those applicants who will shortlisted from Part A. All Candidate securing cut off marks will be shortlisted for Part B.
8. The minimum marks to be obtained by the applicants in Part B examination shall be 60% in case of Unreserved Candidates and 55% in case of OBC (Non-Creamy Layer) candidates.
9. Part B examination will consist of Conventional Questions with all types, including fill in the blanks, calculation based, and descriptive. The marks for each question will be stated on the question paper.
10. Applicants are required to bring their own non-programmable scientific calculator for both Part A and Part B of the written examination.
11. Syllabus of the written examination for Posts of Assistant Engineer (Civil):-

### **Part 1 : Building Construction**

<b>1.1</b>	<b>Excavation / filling: Methods and Equipment</b> : Different Soils - Normal soil, disintegrated rock, ordinary rock, hard rock; Under water; Liquid mud, pumping out water : Carriages of materials, Hire changes of materials, minimum wages
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	<ul style="list-style-type: none"> <li>: Surface excavation, Excavation in foundations, trenches &amp; drains; excavating trenches for pipes,</li> <li>  Cables; Close timbering in case of shafts, wells, cesspits;</li> <li>: Filling in layers; consolidation</li> <li>: Safety precautions during Excavation, Planking, Strutting, packing materials for cavities, open timbering; Fencing, Shoring</li> <li>: Plant &amp; machinery used for excavation and trenching</li> <li>: Measurements of various items as per IS:1200</li> </ul>
<b>1.2</b>	<b>Anti-Termite Treatment</b>
<b>1.3</b>	<b>Materials of Construction</b> <ul style="list-style-type: none"> <li>: Types of Cements: OPC, PPC, SRC, etc.; Blended Cements; Storage and shelf-life</li> <li>: Aggregates – Fine and Coarse Aggregates</li> <li>: Water and its chemical properties</li> <li>: Steel – Reinforcement bars; Prestressing steel (Wires, Strands and Bars); Bonded and Unbonded Tendons; Structural steel; Welding electrodes</li> <li>: Admixtures – Chemical Admixtures; Mineral Admixtures; Suitability of admixtures for different applications</li> <li>: Special materials – Artificial aggregates; Recycled aggregates; Special reinforcement bars; Epoxy-coated steel bars; Fiber reinforced plastic bars; Fibers</li> <li>: Other Materials used in prestressing – Anchorages and Couplers; Sheaths; Coating materials for unbonded tendons; Anchorage blocks and Jacks; Anchorage devices and wedges</li> <li>: Mechanical Couplers</li> </ul>
<b>1.3</b>	<b>Exposure Conditions</b> <ul style="list-style-type: none"> <li>: Mild, Moderate, Severe, Very severe, Extreme</li> <li>: Nominal Cover; Requirement of concrete cover to meet durability requirements; Nominal Cover to meet specified period of fire resistance;</li> <li>: Minimum Cement content, Maximum water cement ratio and minimum grade of concrete for different exposure conditions</li> </ul>
<b>1.4</b>	<b>Mortars: Grades and Mix Design</b> <ul style="list-style-type: none"> <li>: Types of mortars and their uses in various components of buildings</li> <li>: Mortar Mixes</li> <li>: Mortar Grades</li> <li>: Testing of Mortars</li> </ul>
<b>1.5</b>	<b>Concrete: Grades, Mix Design, Placing, Pumping and Workmanship</b> <ul style="list-style-type: none"> <li>: Minimum grade, Characteristic compressive strength</li> <li>: Minimum Cement Content, Importance of Water Cement Ratio</li> <li>: Design Mix; Nominal Mix; Minimum allowable mix; Standard deviation</li> <li>: Batching of concrete; Mixing of concrete; Workability</li> <li>: Properties of Fresh, Hardened and Special Concretes</li> <li>: Concretes in Aggressive Soils and Water</li> <li>: Vibration and compaction of concrete</li> <li>: Finishing of concrete, Curing of concrete, (First three days) Gel formation, Basis of curing</li> <li>: Cracks in concrete</li> </ul>
<b>1.6</b>	<b>Formwork: Materials, Design, Workmanship and Removal</b> <ul style="list-style-type: none"> <li>: Materials Used – Types; Material Properties; Handling and Storage Requirements</li> <li>: Design – Design Requirements, Deciding bottom formwork from expected deflection criteria of concrete members</li> <li>: Workmanship in Erection, joints in formwork supports, Bracing of formwork</li> <li>: Importance of no leakage of cement slurry from formwork during concreting</li> <li>: Removal of formwork – Strength criteria; Removal Sequence</li> <li>: Quality Assurance Methods</li> </ul>
<b>1.7</b>	<b>Reinforcement: Materials, Testing, Couplers, Bar Bending and Placing</b> <ul style="list-style-type: none"> <li>: Bending tolerances, Principles of detailing, Bar Bending schedule, Locations of laps and no-lap; 135° Hooks</li> <li>: Detailing as per SP:34 and IS:13920 for Horizontal Members, Vertical Elements, Beam-Column Joints, Foundations, Retaining Structures, Water Storage Tanks</li> </ul>

1.8	<b>Construction Equipment and Machinery</b> : Types of machinery : Output of some basic machinery : Calculation for output for planning of equipment and machinery in a project : Batching Plant Details of assembly and planning, Delivery planning, Material planning
1.9	Structural Steel
<b>Part 2 : Quality Control</b>	
2.1	<b>Inspection &amp; Acceptance Criteria of Reinforced Concrete, Structural Steel, Prestressed Concrete Precast Concrete</b> Inspection & acceptance criteria of : All constituent materials : Reinforcement Steel – Bar bending, use of couplers, and steel reinforcement caging : Formwork – Erection, removal sequence, reuse, and finished surface : RC, PSC and Precast members – Making, placing, curing, de-shuttering : Concrete – Fresh and hardened : Structural Steel – Tolerance, Welding, and bolting : Precast Concrete Structures – Tolerances in Joints, Method of Jointing components : Record keeping
2.2	<b>Special Issues in Concrete Construction</b> : Safety during Construction : Treatment of construction joints : Hot and cold weather concreting : Placing concrete under water
2.3	<b>Quality Assurance</b> : Monitoring Methods : Construction Joints : Record Keeping
2.4	<b>Construction using Special Concretes</b> : Pumping of concrete : High strength and Self-compacting concretes : Shotcrete
2.5	<b>Construction Methods</b> : Precast construction – Tilt-up construction, and Factory made components; : Criticality and importance of joints in precast elements : Underwater concrete : Roads and Pavements
2.6	<b>Reinforcement Detailing of Buildings</b> : Moment Frame Buildings with Unreinforced Masonry Infills : RC Structural Wall-Frame Buildings with Unreinforced Masonry Infills
2.7	<b>Masonry Work</b> : Brick Masonry – Bonds; Details of junctions, pier, jambs, footings, and corbelling; Damp-proof course, sills, thresholds, and coping; mortar joints and pointing : Stone Masonry – Hollow blocks, solid block; importance of bond stones : Composite Masonry – Exposed brickwork/Stonework
2.8	<b>Cladding</b> : Types (Exterior, Interior) – Brick-tile cladding, stone cladding, granite cladding, marble cladding, ACP Panel cladding : Fixing arrangement of various cladding materials : Precautions, water drainage and quality assurance
2.9	<b>Doors, Windows, Ventilators, Rolling Shutters, Grills</b> : Wooden paneled, Hardwood, Compressed wood Frames and shutters : MS doors and Windows, Rolling shutters, Grills, Railing handrail : Paneled and glazed shutters : Wooden/MS frame and various types of shutters for doors and windows : Various types of glass with different coatings, : Hardware fittings for doors, : Full hardened glass with patch fittings

	<ul style="list-style-type: none"> <li>: Aluminum partitions, doors, windows, ventilators and grills</li> <li>Sliding section, Casement section</li> <li>: Design of aluminum sections</li> <li>: Structural glazing</li> <li>: UPVC doors and windows</li> </ul>
<b>2.10</b>	<b>Flooring</b> <ul style="list-style-type: none"> <li>: Natural stones, brick on edge, granolithic flooring, Vacuum dewatered flooring</li> <li>: Terrazo tile flooring, Eurocon Tiles</li> <li>: Tile flooring, Wooden flooring, Ceramic Glazed flooring,</li> <li>: Vitrified tile flooring</li> <li>: Flooring patterns, jointing, finishing</li> <li>: Expansion of tiles and methods to avoid lifting of tiles</li> </ul>
<b>2.11</b>	<b>Roofing</b> <ul style="list-style-type: none"> <li>: Sheetting: GI, Asbestos, PVC, Metal, Pre-colour-coated, Sandwich PUF Panels, Turbo Ventilator,</li> <li>Ridge ventilators, Skylights</li> <li>: Steel and RC Trusses and Portals</li> <li>: Waterproofing on RC slab; False Ceiling of Gypsum, or Tiles, coordination of ceiling design pattern with light fixtures and air-conditioning fittings / fixtures</li> <li>: Warrantee and Guarantee</li> </ul>
<b>2.12</b>	<b>Finishing</b> <ul style="list-style-type: none"> <li>: Various Cement Plasters in Fine sand, coarse sand, Single coat, two coats, Rough cast plaster, Pebble dash plaster, Artificial Stone Plaster, Cement mortar bands, Pointing</li> <li>: Interior and Exterior finishing, crack fillers</li> <li>: Weather proof coat for exterior</li> <li>: Warrantee and Guarantee</li> </ul>
<b>2.13</b>	<b>Water Proofing</b> <ul style="list-style-type: none"> <li>: Types</li> <li>: Procedure</li> </ul>
<b>Part 3 : Services</b>	
<b>3.1</b>	<b>Water Supply</b> <ul style="list-style-type: none"> <li>: Sources of water, Classification: Raw Water, Drinking water, Process Water</li> <li>: Water Supply Systems, Water quality depending on usage, Pumping and Distribution</li> <li>: Types of fittings, valves, check valves, foot valves, sump, pump check valves, NR valves, pressure gauges, Leak Test</li> <li>: Cold/Hot water distribution, Quality control of different materials used (like GI, and UPVC)</li> <li>: Calculation of Drinking, Raw and Process water requirement, Calculation of water storage tank</li> <li>: Hydro pneumatic system of water supply</li> <li>: Types of pipes</li> <li>: Pipe flow network diagram and calculation</li> <li>: Pressure pipes and Non Pressure pipes</li> <li>: Rainwater harvesting</li> <li>Roof top harvesting and Surface runoff harvesting</li> <li>: Ground water recharge by rainwater</li> </ul>
<b>3.2</b>	<b>Sanitation</b> <ul style="list-style-type: none"> <li>: Sewerage systems for buildings, pipelines, Gully Traps, Inspection Chambers, Manholes, Smoke Test, Septic Tanks, overflow connection to public sewers, Treatment Plant</li> <li>: Types of fixtures and fittings, vent pipes, stop cocks, etc</li> <li>: Soil absorption system, solid waste collection and removal from septic tanks</li> <li>: Calculation of Sewage generation and capacity of septic tank</li> <li>: Natural treatment system</li> <li>Decentralized Wastewater Treatment System</li> <li>: Sewage conduit material and specification</li> <li>: Sewage flow calculation through conduit</li> </ul>
<b>3.3</b>	<b>Roads &amp; Pavements</b> <ul style="list-style-type: none"> <li>: Types of Roads and Pavements and construction details; Design and Service life</li> <li>: WBM, WMM, Stone Paved, Brick Paved, Concrete Roads</li> <li>: Soil Stabilisation, Drainage of rain water, sub-drains, culverts, etc</li> </ul>

	<ul style="list-style-type: none"> <li>: Kerb stone system and design</li> <li>: Paver blocks system and design</li> <li>: Road drainage system and design</li> </ul>
<b>Part 4: Miscellaneous Works</b>	
<b>4.1</b>	<b>Survey &amp; Leveling</b> <ul style="list-style-type: none"> <li>: Basics of Surveying, scales, symbols, sources of error, measurement methods</li> <li>: Theodolite, Total Station survey, Digital Survey</li> <li>: Site Studies, Topography, Land Use, Mapping, Locating building accurately, Locating Levels of building and adjoining infrastructure</li> </ul>
<b>4.2</b>	<b>Estimation and Costing</b> <ul style="list-style-type: none"> <li>: Quantity Surveying, Units of measurements, Approximate methods estimate (Plinth &amp; cubic area)</li> <li>: Detailed estimation of building quantities as per CPWD DSR, Rate Analysis</li> <li>: Specifications as per DSR, purpose and importance of specifications</li> <li>: Cement and Steel requirement as per estimate</li> </ul>
<b>Part 5 : Maintenance</b>	
<b>5.1</b>	<b>Basis for Maintenance</b> <ul style="list-style-type: none"> <li>: Overall strategy of maintenance</li> <li>: Classification of maintenance</li> <li>: Buildings: Design life</li> <li>: Water Supply Lines</li> <li>: Sewerage Systems</li> <li>: Electrical Installation</li> <li>: Maintenance of Air-conditioning &amp; Refrigeration System</li> <li>: Maintenance Works - Manpower requirement, Material Management and Tools Requirement</li> </ul>
<b>5.2</b>	<b>Inspection</b> <ul style="list-style-type: none"> <li>: Items &amp; tools for inspection</li> <li>: Locations of inspection</li> <li>: Types of inspection</li> <li>: Monitoring</li> </ul>
<b>5.3</b>	<b>Record Keeping</b>
<b>Part 6 : Structural Design</b>	
<b>6.1</b>	<b>Loads</b> <ul style="list-style-type: none"> <li>: Dead and Live Loads</li> <li>: Wind Load</li> <li>: Temperature Effects</li> <li>: Earthquake Effects</li> </ul>
<b>6.2</b>	<b>Structural Mechanics</b> <ul style="list-style-type: none"> <li>: Bending moment and shear force diagrams</li> <li>: Stress and strain relations</li> <li>: Stress and strain in two dimensions, principal stresses, stress transformation, mohr's circle</li> <li>: Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre</li> <li>: Thin walled pressure vessels</li> <li>: Uniform torsion</li> <li>: Buckling of column, combined and direct bending stresses</li> </ul>
<b>6.3</b>	<b>Structural Analysis</b> <ul style="list-style-type: none"> <li>: Linear Analysis</li> <li>: Determinate Structures</li> <li>: Indeterminate Structures</li> <li>: Basics of Matrix Methods of Structural Analysis</li> </ul>
<b>6.4</b>	<b>Structural Design</b> <ul style="list-style-type: none"> <li>: Methods of Design - Working Stress Design; Limit State Design</li> <li>: Reinforced Concrete Structures - Beams, Slabs, Columns, Walls, Foundations, Joints</li> <li>: Steel Structures - Beams, Slabs, Columns, Walls, Foundations. Connections</li> <li>: Masonry Structures - - Beams, Slabs, Columns, Walls, Foundations, Bands</li> </ul>
<b>6.5</b>	<b>Soil Mechanics</b> <ul style="list-style-type: none"> <li>: Basics of Soils</li> <li>: Soil classification</li> <li>: Properties of soil</li> </ul>

	<ul style="list-style-type: none"> <li>: Permeability &amp; seepage</li> <li>: Effective stress principle</li> <li>: Consolidation, compaction, shear strength</li> </ul>
<b>6.6</b>	<p><b>Foundation Engineering</b></p> <ul style="list-style-type: none"> <li>: Sub-surface investigations – Drilling bore holes, sampling, penetration tests, plate load test</li> <li>: Earth Pressure Theories, Effect of water table, layered soils</li> <li>: Foundation types – Foundation design requirements</li> <li>: Shallow foundations – Bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands &amp; clays</li> <li>: Deep foundations – Pile types, dynamic &amp; static formulae, load capacity of piles in sands and clays, negative skin friction</li> </ul>
<b>6.7</b>	<p><b>Fluid Mechanics</b></p> <ul style="list-style-type: none"> <li>: Properties of fluids</li> <li>: Principle of conservation of mass, momentum, energy and governing equations</li> <li>: Potential flow</li> <li>: Applications of momentum and Bernoulli's equation, laminar and turbulent flow</li> <li>: Flow in pipes - Pipe networks</li> <li>: Forces on immersed bodies</li> <li>: Flow measurements in channels, tanks and pipes</li> <li>: Pumps and turbines</li> </ul>
<b>6.8</b>	<p><b>Public Health Engineering</b></p> <ul style="list-style-type: none"> <li>: Water – Quality standards, basic unit processes and operations for water treatment; Drinking water standards, water requirements</li> <li>: Sewage and sewerage treatment – Quantity and characteristics of wastewater; Primary, secondary and tertiary treatment of wastewater; Sludge disposal, effluent discharge standards</li> <li>: Domestic wastewater treatment – Quantity and characteristics of domestic wastewater; Primary and secondary treatment; Sludge disposal</li> <li>: Municipal solid wastes – Characteristics, generation, collection and transportation of solid wastes; Engineered systems for solid waste management (reuse/recycle, energy recovery, treatment and disposal)</li> <li>: Noise pollution – Permissible limits; Measurement and control</li> </ul>
<b>6.9</b>	<p><b>Transportation Engineering</b></p> <ul style="list-style-type: none"> <li>: Geometric design of roads</li> <li>: Testing and specifications of paving materials, design of flexible and rigid pavements</li> </ul>
<b>Part 7 : Green / Sustainable Buildings</b>	
<b>7.1</b>	<b>Green Concepts as per CPWD and DSR</b>
<b>7.2</b>	<b>Advantages and applicability in Indian Context</b>
<b>7.3</b>	<b>Sustainability</b>
<b>Part 8 : Project Management</b>	
<b>8.1</b>	<p><b>Resource Management</b></p> <ul style="list-style-type: none"> <li>: Bar Chart</li> <li>: PERT, CPM</li> <li>: Lean Construction Concepts</li> <li>: S-Curve</li> <li>: Software tools for Project Management</li> <li>: Resource allocation</li> <li>: Planning of Manpower, Machinery, Materials and Budget</li> </ul>
<b>8.2</b>	<p><b>Construction Safety</b></p> <ul style="list-style-type: none"> <li>: Standards</li> <li>: Codes and Rules</li> <li>: System to be adopted at site for various activities</li> </ul>
<b>8.3</b>	<p><b>Labor Management</b></p> <ul style="list-style-type: none"> <li>: Standards</li> <li>: Codes and Rules</li> </ul>

	: System to be adopted at labor hutment : Sanitation and Hygiene
<b>8.4</b>	<b>Building Information Management System</b> : Overall Concept : Metering, Monitoring and Modifying Use of Resources
<b>Part 9 : Tendering and Billing</b>	
<b>9.1</b>	<b>CPWD Manual and Procedure</b>
<b>9.2</b>	<b>DSR Rates and Analysis Of Rates</b>
<b>9.3</b>	<b>Defect Liability and Penalty</b>
<b>9.4</b>	<b>Arbitration</b>
<b>Part 10 : GRIHA Rating</b>	
<b>10.1</b>	<b>GRIHA Rating</b> : Organization responsible : Basic criteria : Approach : Marking system and range for various ratings
<b>10.2</b>	<b>GRIHA Rating for buildings</b>
<b>10.3</b>	<b>GRIHA Rating for urban cluster</b>
<b>Annexure</b>	
<i>A</i>	<i>Material Test Procedures</i> <i>A.1 Cement</i> <i>A.2 Aggregate</i> <i>A.3 Water</i> <i>A.4 Concrete: Green and Hardened</i> <i>A.5 Reinforcement</i> <i>A.6 Bricks</i> <i>A.7 Hollow Blocks</i> <i>A.8 Solid Blocks</i> <i>A.9 Lime</i> <i>A.10 Sand</i> <i>A.11 Marble</i> <i>A.12 Timber</i> <i>A.13 Flush door</i> <i>A.14 Aluminium door /Window</i> <i>A.15 Mortice Lock</i> <i>A.16 Terrazo Tiles</i> <i>A.17 Glazed Tiles</i> <i>A.18 Piles</i>
<i>B</i>	<i>Full Structure Test Procedures</i>

**Note:-**

- ❖ The Final Selection /Recruitment to the services/ Posts mentioned above will be made on the basis of Merit in written examination of respective stream. Candidate securing more marks is to be ranked higher and if there is a tie between the candidates' scores, In that case the candidate with earlier "Date of Birth" (eldest) will be selected for further procedure.

**Administrative Officer**  
**AIIMS, Jodhpur**