Staff Selection Commission (SSC)

About SSC:

Staff Selection Commission (SSC) is an organization under Government of India to recruit staff for various posts in the various Ministries and Departments of the Government of India and in Subordinate Offices. The Staff Selection Commission was established in 1975.

Exams Conducted By SSC

SSC currently functions as a subordinate office of DOPT and is mainly engaged in conducting competitive exams for recruitment to various posts in the SSC departments, organizations. In the previous years, SSC has conducted various exams as given below:

- SSC Combined Graduate Level Exam (SSC CGL)
- SSC Combined Higher Secondary Level Exam (SSC CHSL)
- SSC Junior Engineer Exam
- SSC Junior Hindi Translator Exam
- SSC GD Constable Exam
- SSC Multitasking Staff Exam (SSC MTS)
- SSC Staff Selection Post Exam
- SSC SI in CAPFs, ASI in CISF and SI in Delhi Police Exam
- SSC Stenographer Grade 'C' & 'D' Exam

SSC JE is an exam conducted by Staff Selection Commission (SSC). This exam is meant for the recruitment of Junior Engineers (JEs) in various branches of Engineering including Civil, Electrical, Mechanical and Quantity Surveying & Contracts. The purpose of this exam is to recruit candidates for Group-B (non-gazetted) posts in level-6 (Rs 35,400-1,12,400) of pay matrix of the seventh Central Pay Commission.

The various posts that shall be filled up through SSC JE 2020 exam are:

SSC JE Posts	**Departments Recruiting**
JE Civil	Central Water Commission
JE Mechanical	Central Water Commission
JE Civil	Central Public Works Department (CPWD)
JE Electrical	Central Public Works Department (CPWD)
JE Civil	Military Engineer Services (MES)
JE Electrical & Mechanical	Military Engineer Services (MES)
JE Civil	Farakka Barrage Project
JE Electrical	Farakka Barrage Project
JE Mechanical	Farakka Barrage Project
JE Civil	Border Road Organization (BRO)
JE Electrical & Mechanical	Border Road Organization (BRO)

JE Civil	Central Water and Power Research Station
JE Electrical	Central Water and Power Research Station
JE Mechanical	Central Water and Power Research Station
JE Mechanical	Directorate of Quality Assurance (Naval)
JE Electrical	Directorate of Quality Assurance (Naval)
JE Civil	National Technical Research Organization (NTRO)
JE Electrical	National Technical Research Organization (NTRO)
JE Mechanical	National Technical Research Organization (NTRO)

Age Limit:

Candidates who are interested to take the SSC Junior Engineer exam should be of **at least 18 years of age and not more than 32 years**.

Exam Fee

Candidates are required to pay **Rs. 100/-** as their application fee for SSC JE 2021 Exam. **Female Candidates, Ex. Servicemen and Candidates belonging to reserved categories are exempted from paying the application fee for SSC JE 2021 Exam**. The fee can be paid both online (net banking/debit card/credit card) and offline (e-challan).

SSC JE Vacancies Details

Given below is the post wise detailed information on the SSC JE vacancy list for each branch. For the category wise breakdown of the vacancies, candidates can check out the official notice from above.

Tentative Vacancy List for SSC JE 2020 (Department Wise)

M/o Defence (DGQA-NAVAL)	**Total Vacancy**
JE (Mechanical)	4
JE (Electrical)	1
Central Water Commission	
JE (Civil)	64
JE (Mechanical)	13

Border Road Organization	
Junior Engineer(Civil)	75
Central Public Works Department (CPWD)	
JE (Civil)	48
JE (Electrical)	33
Military Engineering Services (MES)	
Junior Engineer (Civil)	271
Junior Engineer(Electrical & Mechanical)	163
Central Water Power Research Station (CWPRS)	
Junior Engineer(Electrical)	1
Junior Engineer(Civil)	2
Farrakhan Barrage Project (FBP)	
Junior Engineer(Mechanical)	1
Total	**785**

Important Dates

SSC JE 2021: Important Dates	
Events	**Dates**
Notification Release Date	1st October, 2020
Last Date to Apply Online	30th October, 2020
Tier-I Admit Card	12th March 2021
Commencement of Tier-I Exam	22nd March to 24th March 2021
SSC JE Tier-I Result & Cut-Off	30th June 2021
Tier-II Admit Card	September 2021
Commencement of Tier-II Exam	26th September 2021

SSC Junior Engineer

SSC will conduct SSC JE Exam to recruit eligible candidates for the post of Junior Engineers Civil, Electrical, Mechanical, Quantity Surveying and Contract Posts. The posts are Group "B" (Non- Gazetted).

The SSC JE Exam Pattern comprises of two stages:

(i) Paper I (Computer-based Test)

(ii) Paper-II (Descriptive/Written Test)

A. SSC JE paper –I Exam Pattern:

Papers	**Mode of Examination**	**Subject**	**No. of Questions/ Maximum Marks**	**Duration & Timings**
Paper - I Objective Type	Computer based Examination	I. General Intelligence and Reasoning	50/ 50	2 Hours
		ii. General Awareness	50/ 50	
		iii. Part- A General Engineering (Civil & Structural)	100/ 100	
		or Part B - General Engineering (Electrical)		
		or Part C - General Engineering (Mechanical)		

B. SSC JE Paper-II (Descriptive/Written Test):

Paper - II (Descriptive Type)	Written Examination	Part-A General Engineering (Civil & Structural) or Part-B General Engineering (Electrical) or Part-C General Engineering (Mechanical)	300	2 Hours

Note:

- The Paper-I will consist of Objective Type, Multiple choice questions only. The questions will be set both in English & Hindi.
- There will be negative marking of 0.25 marks for each wrong answer in Paper-I.

SSC JE Tier-1 Cut Off 2020-21		
Category	**Civil Engineering**	**Electrical/ Mechanical**

		Engineering
General	120.02518	141.59716
OBC	114.21184	131.23676
EWS	108.14574	151.04061
SC	99.15648	123.23149
ST	99.15648	115.34476
OH	79.83729	99.43252
HH	48.86278	63.07700

SSC JE Tier-1 Cut Off 2019-20		
Category	**Civil & Structural Engineering**	**Electrical/ Mechanical Engineering**
General	123.52838	157.47167
OBC	115.93457	153.26874
EWS	112.28955	151.04061
SC	101.70364	140.59015
ST	102.61781	135.88541
OH	92.24190	127.29476
HH	55.73328	92.49467

SSC JE 2019 Cut Off

Category	**Civil Engineering**	**Electrical/ Mechanical Engineering**
UR	129.00	154.25
OBC	124.75	151.25
SC	109.50	135.00
ST	109.00	127.50
OH	99.50	112.00
HH	63.75	72.50
EWS	120.99	149.00

SSC JE Mains Cut Off 2018

Category	Civil Engineering	Electrical/ Mechanical Engineering
UR	250.49	304.61
EWS	229.05	298.93
OBC	209.38	255.56
SC	193.68	217.74
ST	201.54	215.52
Ex.S	–	–
OH	162.01	223.81
HH	132.68	148.39
VH	–	–
Total Selected Candidates	**3800**	**883**

JUNIOR ENGINEERS (CIVIL, MECHANICAL, ELECTRICAL, and QUANTITY SURVEYING & CONTRACT) EXAMINATION

Indicative Syllabus

The standard of the questions in Engineering subjects will be approximately of the level of Diploma in Engineering (Civil/ Electrical/ Mechanical/Electronics) from a recognized Institute, Board or University recognized by All India Board of Technical Education. All the questions will be set in SI units. The details of the syllabus are given below:

Paper-I

(i) General Intelligence & Reasoning: The Syllabus for General Intelligence would include questions of both verbal and non-verbal type. The test may include questions on analogies, similarities, differences, space visualization, problem solving, analysis, judgment, decision making, visual memory, discrimination, observation, relationship concepts, arithmetical reasoning, verbal and figure classification, arithmetical number series etc. The test will also include questions designed to test the candidate's abilities to deal with abstract ideas and symbols and their relationships, arithmetical computations and other analytical functions.

(ii) General Awareness**:** Questions will be aimed at testing the candidate's general awareness of the environment around him/her and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in their scientific aspect as may be expected of any educated person. The test will also include questions relating to India

and its neighbouring countries especially pertaining to History, Culture, Geography, Economic Scene, General Polity and Scientific Research, etc. These questions will be such that they do not require a special study of any discipline.

(iii) General Engineering (Civil and Structural), (Electrical & Mechanical):

Part- A Civil Engineering

Building Materials, Estimating, Costing and Valuation, Surveying, Soil Mechanics, Hydraulics, Irrigation Engineering, Transportation Engineering, Environmental Engineering.

Structural Engineering: Theory of Structures, Concrete Technology, RCC Design, Steel Design.

Part-B Electrical Engineering

Basic concepts, Circuit law, Magnetic Circuit, AC Fundamentals, Measurement and Measuring instruments, Electrical Machines, Fractional Kilowatt Motors and single phase induction Motors, Synchronous Machines, Generation, Transmission and Distribution, Estimation and Costing, Utilization and Electrical Energy, Basic Electronics.

Part-C Mechanical Engineering – Theory of Machines and Machine Design, Engineering Mechanics and Strength of Materials,

Properties of Pure Substances, 1st Law of Thermodynamics, 2nd Law of Thermodynamics, Air standard Cycles for IC Engines, IC Engine Performance, IC Engines Combustion, IC Engine Cooling & Lubrication, Rankine cycle of System, Boilers, Classification, Specification, Fitting & Accessories, Air Compressors & their cycles, Refrigeration cycles, Principle of Refrigeration Plant, Nozzles & Steam Turbines.

Properties & Classification of Fluids, Fluid Statics, Measurement of Fluid Pressure, Fluid kinematics, Dynamics of Ideal fluids, Measurement of Flow rate, basic principles, Hydraulic Turbines, Centrifugal Pumps, Classification of steels.

Paper II

Part-A :Civil & Structural Engineering

Civil Engineering

Building Materials **:** 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.

Estimating, Costing and Valuation: estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (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, Trapezodial 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.

Surveying **:** 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, Levelling, Definition of terms used in levelling, 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.

Soil Mechanics : 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, 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.

Hydraulics : Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

Irrigation Engineering: Definition, necessity, benefits, 2II effects of irrigation, 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.

Transportation Engineering: Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. Surface water drainage. Solid waste management – types, effects, engineered management system. Air pollution – pollutants, causes, effects, control. Noise pollution – cause, health effects, control.

Structural Engineering

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.

Part-B (Electrical Engineering):

Basic concepts : Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.
Circuit law **:** Kirchhoff's law, Simple Circuit solution using network theorems.
Magnetic Circuit : Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.

AC Fundamentals: Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system – star and delta connection, 3 phase power, DC and sinusoidal response of R-Land R-C circuit.

Measurement and measuring instruments: Measurement of power (1 phase and 3 phase, both active and re-active) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving oil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.

Electrical Machines : (a) D.C. Machine – Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines. (b) 1 phase and 3 phase transformers – Construction, Principles of operation, equivalent circuit, voltage regulation, 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 transformers. Auto transformers. (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics.

Fractional Kilowatt Motors and Single Phase Induction Motors: Characteristics and applications.

Synchronous Machines - Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors.

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 circuit current for symmetrical faults. Switchgears – rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable – Different type of cables, cable rating and derating factor.

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

Utilization of Electrical Energy : Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.

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.

Part- C (Mechanical Engineering):

Theory of Machines and Machine Design

Concept of simple machine, Four bar linkage and link motion, Flywheels and fluctuation of energy, Power transmission by belts – V-belts and Flat belts, Clutches – Plate and Conical clutch, Gears – Type of gears, gear profile and gear ratio calculation, Governors – Principles and classification, Riveted joint, Cams, Bearings, Friction in collars and pivots.

Engineering Mechanics and Strength of Materials

Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, Bending moments and shear force diagram, Stress in composite bars, Torsion of circular shafts, Bucking of columns – Euler's and Rankin's theories, Thin walled pressure vessels.

Thermal Engineering

Properties of Pure Substances : p-v & P-T diagrams of pure substance like H_2O, Introduction of steam table with respect to steam generation process; definition of saturation, wet & superheated status. Definition of dryness fraction of steam, degree of superheat of steam. H-s chart of steam (Mollier's Chart).

1st Law of Thermodynamics : Definition of stored energy & internal energy, 1st Law of Thermodynamics of cyclic process, Non Flow Energy Equation, Flow Energy & Definition of Enthalpy, Conditions for Steady State Steady Flow; Steady State Steady Flow Energy Equation.

2nd Law of Thermodynamics : Definition of Sink, Source Reservoir of Heat, Heat Engine, Heat Pump & Refrigerator; Thermal Efficiency of Heat Engines & co-efficient of performance of Refrigerators, Kelvin – Planck & Clausius Statements of 2nd Law of Thermodynamics, Absolute or Thermodynamic Scale of temperature, Clausius Integral, Entropy, Entropy

change calculation of ideal gas processes. Carnot Cycle & Carnot Efficiency, PMM-2; definition & its impossibility.

Air standard Cycles for IC engines : Otto cycle; plot on P-V, T-S Planes; Thermal Efficiency, Diesel Cycle; Plot on P-V, T-S planes; Thermal efficiency.

IC Engine Performance, IC Engine Combustion, IC Engine Cooling & Lubrication.
Rankine cycle of steam **:** Simple Rankine cycle plot on P-V, T-S, h-s planes, Rankine cycle efficiency with & without pump work.

Boilers; Classification; Specification; Fittings & Accessories : Fire Tube & Water Tube Boilers.

Air Compressors & their cycles; Refrigeration cycles; Principle of a Refrigeraton Plant; Nozzles & Steam Turbines

Fluid Mechanics & Machinery

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.
Dynamics of ideal fluids : Bernoulli's equation, Total head; Velocity head; Pressure head; Application of Bernoulli's equitation.

Measurement of Flow rate Basic Principles : Venturimeter, Pilot tube, Orifice

meter.

Hydraulic Turbines : Classifications, Principles.

Centrifugal Pumps : Classifications, Principles,

Performance. Production Engineering

Classification of Steels : mild steal & alloy steel, Heat treatment of steel, Welding – Arc Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e. TIG, MIG, etc. (Brazing & Soldering), Welding Defects & Testing; NDT, Foundry & Casting – methods, defects, different casting processes, Forging, Extrusion, etc, Metal cutting principles, cutting tools, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding, Machines, tools & manufacturing processes.