

# Indian Engineering Services (IES)

## ABOUT:

The Indian Engineering Services (IES) are the services which cater to the technical and managerial functions of the government of India in the field of engineering. Indian Engineering Services (IES) exam, also known as Engineering Services Examination (ESE), is a national level recruitment exam organized by Union Public Services Commission (UPSC). A three-stage competitive examination (preliminary, main and personality tests), the Engineering Services Examination (ESE), is conducted by the UPSC for recruitment to the Indian Engineering Services. The exam is conducted to recruit candidates for engineering posts under the Government of India. The Engineering Services Examination is conducted for four main branches of engineering namely.

- Civil Engineering
- Mechanical Engineering
- Electronics and Communication Engineering

Engineering Services exam is one of the exams that meet the technical requirement of Government of India. Hence, IES exam is considered as one of the toughest examinations in the country. Nearly, two lakh candidates appear for the examination every year. Engineering officers for Government of India are selected on the basis of combined three stage recruitment process - IES Preliminary, IES Main and Personality Test. On the basis of merit of candidates in IES exam, they are recommended to the Union Government for the available posts. Nature of work for an engineering officer selected through IES exam depends on the engineering branch and the cadre s/he is recruited for.

### A. Stage-I(Preliminary/Stage-I) Examination :-

The Examination shall comprise of two papers

| Subject                                            | Duration | Max. Marks |
|----------------------------------------------------|----------|------------|
| <b>Category-I Civil Engineering</b>                |          |            |
| Paper-I (General Studies and Engineering Aptitude) | 2 hrs.   | 200        |
| Paper-II (Civil Engineering)                       | 3 hrs    | 300        |
| <b>Total</b>                                       |          | <b>500</b> |

| Subject | Duration | Max. Marks |
|---------|----------|------------|
|---------|----------|------------|

| <b>Category-II Mechanical Engineering</b>          |        |            |
|----------------------------------------------------|--------|------------|
| Paper-I (General Studies and Engineering Aptitude) | 2 hrs. | 200        |
| Paper-II (Mechanical Engineering)                  | 3 hrs  | 300        |
| <b>Total</b>                                       |        | <b>500</b> |

| <b>Subject</b>                                                | <b>Duration</b> | <b>Max. Marks</b> |
|---------------------------------------------------------------|-----------------|-------------------|
| <b>Category-III Electronics and Communication Engineering</b> |                 |                   |
| Paper-I (General Studies and Engineering Aptitude)            | 2 hrs.          | 200               |
| Paper-II (Electronics and Communication Engineering)          | 3 hrs           | 300               |
| <b>Total</b>                                                  |                 | <b>500</b>        |

### B. Stage-II(Main/Stage-II) Examination:-

The Examination shall comprise of two papers

| <b>Subject</b>                      | <b>Duration</b> | <b>Max. Marks</b> |
|-------------------------------------|-----------------|-------------------|
| <b>Category-I Civil Engineering</b> |                 |                   |
| Paper-I ( Civil Engineering)        | 3 hrs.          | 300               |
| Paper-II (Civil Engineering)        | 3 hrs           | 300               |
| <b>Total</b>                        |                 | <b>600</b>        |

| <b>Subject</b>                            | <b>Duration</b> | <b>Max. Marks</b> |
|-------------------------------------------|-----------------|-------------------|
| <b>Category-II Mechanical Engineering</b> |                 |                   |
| Paper-I (Mechanical Engineering)          | 3 hrs.          | 300               |
| Paper-II (Mechanical Engineering)         | 3 hrs           | 300               |
| <b>Total</b>                              |                 | <b>600</b>        |

| Subject                                                       | Duration | Max. Marks |
|---------------------------------------------------------------|----------|------------|
| <b>Category-III Electronics and Communication Engineering</b> |          |            |
| Paper-I (Electronics and Communication Engineering)           | 3 hrs.   | 300        |
| Paper-II (Electronics and Communication Engineering)          | 3 hrs    | 300        |
| <b>Total</b>                                                  |          | <b>600</b> |

### C. Stage-III(Personality Test) - 200 Marks.

➤ **General Studies and Engineering Aptitude (Preliminary Examination/Stage-I, Objective type, Common to all Candidates)**

1. Current issues of national and international importance relating to social, economic and industrial development
2. Engineering Aptitude covering Logical reasoning and Analytical ability
3. Engineering Mathematics and Numerical Analysis
4. General Principles of Design, Drawing, Importance of Safety
5. Standards and Quality practices in production, construction, maintenance and services
6. Basics of Energy and Environment: Conservation, environmental pollution and degradation, Climate Change, Environmental impact assessment
7. Basics of Project Management
8. Basics of Material Science and Engineering
9. Information and Communication Technologies (ICT) based tools and their applications in Engineering such as networking, e- governance and technology based education.
10. Ethics and values in Engineering profession.

Note: The paper in General Studies and Engineering Aptitude will include Knowledge of relevant topics as may be expected from an engineering graduate, without special study. Questions from all the 10

topics mentioned above shall be set. Marks for each Topic may range from 5% to 15% of the total marks in the paper.

## SYLLABUS:

### MECHANICAL ENGINEERING:

Contents for syllabi of both the Papers together for Preliminary Examination/ Stage-I (objective type Paper-II) and separately for Main/ Stage-II Examination (Conventional type Paper-I and Paper-II).

#### PAPER-I:

- 1. Fluid Mechanics:** Basic Concepts and Properties of Fluids, Manometry, Fluid Statics, Buoyancy, Equations of Motion, Bernoulli's equation and applications, Viscous flow of incompressible fluids, Laminar and Turbulent flows, Flow through pipes and head losses in pipes.
- 2. Thermodynamics and Heat transfer:** Thermodynamic systems and processes; properties of pure substance; Zeroth, First and Second Laws of Thermodynamics; Entropy, Irreversibility and availability; analysis of thermodynamic cycles related to energy conversion: Rankine, Otto, Diesel and Dual Cycles; ideal and real gases; compressibility factor; Gas mixtures. Modes of heat transfer, Steady and unsteady heat conduction, Thermal resistance, Fins, Free and forced convection, Correlations for convective heat transfer, Radiative heat transfer – Radiation heat transfer co-efficient; boiling and condensation, Heat exchanger performance analysis.
- 3. IC Engines, Refrigeration and Air conditioning:** SI and CI Engines, Engine Systems and Components, Performance characteristics and testing of IC Engines; Fuels; Emissions and Emission Control. Vapour compression refrigeration, Refrigerants and Working cycles, Compressors, Condensers, Evaporators and Expansion devices, Other types of refrigeration systems like Vapour Absorption, Vapour jet, thermo electric and Vortex tube refrigeration. Psychometric properties and processes, Comfort chart, Comfort and industrial air conditioning, Load calculations and Heat pumps.
- 4. Turbo Machinery:** Reciprocating and Rotary pumps, Pelton wheel, Kaplan and Francis Turbines, velocity diagrams, Impulse and Reaction principles, Steam and Gas Turbines, Theory of Jet Propulsion – Pulse jet and Ram Jet Engines, Reciprocating and Rotary Compressors – Theory and Applications
- 5. Power Plant Engineering:** Rankine and Brayton cycles with regeneration and reheat, Fuels and their properties, Flue gas analysis, Boilers, steam turbines and other power plant components like condensers, air ejectors, electrostatic precipitators and cooling towers – their theory and design, types and applications;
- 6. Renewable Sources of Energy:** Solar Radiation, Solar Thermal Energy collection - Flat Plate and focusing collectors their materials and performance. Solar Thermal Energy Storage, Applications – heating, cooling and Power Generation; Solar Photovoltaic Conversion; Harnessing of Wind Energy, Bio-mass and Tidal Energy – Methods and Applications, Working principles of Fuel Cells.

## PAPER – II:

**1. Engineering Mechanics:** Analysis of System of Forces, Friction, Centroid and Centre of Gravity, Dynamics; Stresses and Strains-Compound Stresses and Strains, Bending Moment and Shear Force Diagrams, Theory of Bending Stresses- Slope and deflection-Torsion, Thin and thick Cylinders, Spheres.

**2. Engineering Materials:** Basic Crystallography, Alloys and Phase diagrams, Heat Treatment, Ferrous and Non Ferrous Metals, Non metallic materials, Basics of Nano-materials, Mechanical Properties and Testing, Corrosion prevention and control

**3. Mechanisms and Machines:** Types of Kinematics Pair, Mobility, Inversions, Kinematic Analysis, Velocity and Acceleration Analysis of Planar Mechanisms, CAMs with uniform acceleration and retardation, cycloidal motion, oscillating followers; Vibrations –Free and forced vibration of undamped and damped SDOF systems, Transmissibility Ratio, Vibration Isolation, Critical Speed of Shafts. Gears – Geometry of tooth profiles, Law of gearing, Involute profile, Interference, Helical, Spiral and Worm Gears, Gear Trains- Simple, compound and Epicyclic; Dynamic Analysis – Slider – crank mechanisms, turning moment computations, balancing of Revolving & Reciprocating masses, Gyroscopes –Effect of Gyroscopic couple on automobiles, ships and aircrafts, Governors.

**4. Design of Machine Elements:** Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as riveted, welded and bolted joints. Shafts, Spur gears, rolling and sliding contact bearings, Brakes and clutches, flywheels.

**5. Manufacturing ,Industrial and Maintenance Engineering:** Metal casting-Metal forming, Metal Joining, Machining and machine tool operations, Limits, fits and tolerances, Metrology and inspection, computer Integrated manufacturing, FMS, Production planning and Control, Inventory control and operations research - CPM-PERT. Failure concepts and characteristics-Reliability, Failure analysis, Machine Vibration, Data acquisition, Fault Detection, Vibration Monitoring, Field Balancing of Rotors, Noise Monitoring, Wear and Debris Analysis, Signature Analysis, NDT Techniques in Condition Monitoring.

**6. Mechatronics and Robotics:** Microprocessors and Microcontrollers: Architecture, programming, I/O, Computer interfacing, Programmable logic controller. Sensors and actuators, Piezoelectric accelerometer, Hall effect sensor, Optical Encoder, Resolver, Inductosyn, Pneumatic and Hydraulic actuators, stepper motor, Control Systems- Mathematical modeling of Physical systems, control signals, controllability and observability. Robotics, Robot Classification, Robot Specification, notation; Direct and Inverse Kinematics; Homogeneous Coordinates and Arm Equation of four Axis SCARA Robot.

## ELECTRONICS AND COMMUNICATION ENGINEERING:-

Contents for syllabi of both the Papers together for Preliminary/Stage-I Examination (objective type Paper–II) and separately for Main/Stage-II Examination (Conventional type Paper-I and Paper – II).

## PAPER – I:



**1. Basic Electronics Engineering:** Basics of semiconductors; Diode/Transistor basics and characteristics; Diodes for different uses; Junction & Field Effect Transistors (BJTs, JFETs, MOSFETs); Transistor amplifiers of different types, oscillators and other circuits; Basics of Integrated Circuits (ICs); Bipolar, MOS and CMOS ICs; Basics of linear ICs, operational amplifiers and their applications- linear/non-linear; Optical sources/detectors; Basics of Opto electronics and its applications.

**2. Basic Electrical Engineering:** DC circuits-Ohm's & Kirchoff's laws, mesh and nodal analysis, circuit theorems; Electro-magnetism, Faraday's & Lenz's laws, induced EMF and its uses; Single-phase AC circuits; Transformers, efficiency; Basics-DC machines, induction machines, and synchronous machines; Electrical power sources- basics: hydroelectric, thermal, nuclear, wind, solar; Basics of batteries and their uses.

**3. Materials Science:** Electrical Engineering materials; Crystal structure & defects; Ceramic materials-structures, composites, processing and uses; Insulating laminates for electronics, structures, properties and uses; Magnetic materials, basics, classification, ferrites, ferro/para-magnetic materials and components; Nano materials-basics, preparation, purification, sintering, nano particles and uses; Nano-optical/magnetic/electronic materials and uses; Superconductivity, uses.

**4. Electronic Measurements and Instrumentation:** Principles of measurement, accuracy, precision and standards; Analog and Digital systems for measurement, measuring instruments for different applications; Static/dynamic characteristics of measurement systems, errors, statistical analysis and curve fitting; Measurement systems for non-electrical quantities; Basics of telemetry; Different types of transducers and displays; Data acquisition system basics.

**5. Network Theory:** Network graphs & matrices; Wye-Delta transformation; Linear constant coefficient differential equations- time domain analysis of RLC circuits; 26 Solution of network equations using Laplace transforms- frequency domain analysis of RLC circuits; 2-port network parameters-driving point & transfer functions; State equations for networks; Steady state sinusoidal analysis.

**6. Analog and Digital Circuits:** Small signal equivalent circuits of diodes, BJTs and FETs; Diode circuits for different uses; Biasing & stability of BJT & JFET amplifier circuits; Analysis/design of amplifier- single/multi-stage; Feedback& uses; Active filters, timers, multipliers, wave shaping, A/D-D/A converters; Boolean Algebra& uses; Logic gates, Digital IC families, Combinatorial/sequential circuits; Basics of multiplexers, counters/registers/ memories /microprocessors, design& applications.

## PAPER – II :

**1. Analog and Digital Communication Systems:** Random signals, noise, probability theory, information theory; Analog versus digital communication & applications: Systems- AM, FM, transmitters/receivers, theory/practice/ standards, SNR comparison; Digital communication basics: Sampling, quantizing, coding, PCM, DPCM, multiplexing-audio/video; Digital modulation: ASK, FSK, PSK; Multiple access: TDMA, FDMA, CDMA; Optical communication: fibre optics, theory, practice/standards.

**2. Control Systems:** Classification of signals and systems; Application of signal and system theory; System realization; Transforms & their applications; Signal flow graphs, Routh-Hurwitz criteria, root loci, Nyquist/Bode plots; Feedback systems-open & close loop types, stability analysis, steady state, transient and frequency response analysis; Design of control systems, compensators, elements of lead/lag compensation, PID and industrial controllers.

**3. Computer Organization and Architecture:** Basic architecture, CPU, I/O organisation, memory organisation, peripheral devices, trends; Hardware /software issues; Data representation & Programming; Operating systems-basics, processes, characteristics, applications; Memory management, virtual memory, file systems, protection & security; Data bases, different types, characteristics and design; Transactions and concurrency control; Elements of programming languages, typical examples.

**4. Electro Magnetics:** Elements of vector calculus, Maxwell's equations-basic concepts; Gauss', Stokes' theorems; Wave propagation through different media; Transmission Lines-different types, basics, Smith's chart, impedance matching/transformation, S- parameters, pulse excitation, uses; Waveguides-basics, rectangular types, modes, cut-off frequency, dispersion, dielectric types; Antennas-radiation pattern, monopoles/dipoles, gain, arrays-active/passive, theory, uses.

**5. Advanced Electronics Topics:** VLSI technology: Processing, lithography, interconnects, packaging, testing; VLSI design: Principles, MUX/ROM/PLA-based design, Moore & Mealy circuit design; Pipeline concepts & functions; Design for testability, examples; DSP: Discrete time signals/systems, uses; Digital filters: FIR/IIR types, design, speech/audio/radar signal processing uses; Microprocessors & microcontrollers, basics, interrupts, DMA, instruction sets, interfacing; Controllers & uses; Embedded systems.

**6. Advanced Communication Topics:** Communication networks: Principles /practices /technologies /uses /OSI model/security; Basic packet multiplexed streams/scheduling; Cellular networks, types, analysis, protocols (TCP/TCP/IP); Microwave & satellite communication: Terrestrial/space type LOS systems, block schematics link calculations, system design; Communication satellites, orbits, characteristics, systems, uses; Fibre-optic communication systems, block schematics, link calculations, system design.

## **CIVIL ENGINEERING:**

Contents for syllabi of both the Papers together for Preliminary Examination/Stage-I (objective type Paper-II) and separately for Main/Stage-II Examination (Conventional type Paper-I and Paper-II).

### **PAPER – I:**

**1. Building Materials:** Stone, Lime, Glass, Plastics, Steel, FRP, Ceramics, Aluminum, Fly Ash, Basic Admixtures, Timber, Bricks and Aggregates: Classification, properties and selection criteria; Cement: Types, Composition, Properties, Uses, Specifications and various Tests; Lime & Cement Mortars and Concrete: Properties and various Tests; Design of Concrete Mixes: Proportioning of aggregates and methods of mix design.

**2. Solid Mechanics:** Elastic constants, Stress, plane stress, Strains, plane strain, Mohr's circle of stress and strain, Elastic theories of failure, Principal Stresses, Bending, Shear and Torsion.

**3. Structural Analysis:** Basics of strength of materials, Types of stresses and strains, Bending moments and shear force, concept of bending and shear stresses; Analysis of determinate and indeterminate structures; Trusses, beams, plane frames; Rolling loads, Influence Lines, Unit load method & other methods; Free and Forced vibrations of single degree and multi degree freedom system; Suspended Cables; Concepts and use of Computer Aided Design.

**4. Design of Steel Structures:** Principles of Working Stress methods, Design of tension and compression members, Design of beams and beam column connections, built-up sections, Girders, Industrial roofs, Principles of Ultimate load design.

**5. Design of Concrete and Masonry structures:** Limit state design for bending, shear, axial compression and combined forces; Design of beams, Slabs, Lintels, Foundations, Retaining walls, Tanks, Staircases; Principles of pre-stressed concrete design including materials and methods; Earthquake resistant design of structures; Design of Masonry Structure.

**6. Construction Practice, Planning and Management:** Construction - Planning, Equipment, Site investigation and Management including Estimation with latest project management tools and network analysis for different Types of works; Analysis of Rates of various types of works; Tendering Process and Contract Management, Quality Control, Productivity, Operation Cost; Land acquisition; Labour safety and welfare.

#### PAPER – II:

**1. Flow of Fluids, Hydraulic Machines and Hydro Power:** (a) Fluid Mechanics, Open Channel Flow, Pipe Flow: Fluid properties; Dimensional Analysis and Modeling; Fluid dynamics including flow kinematics and measurements; Flow net; Viscosity, Boundary layer and control, Drag, Lift, Principles in open channel flow, Flow controls. Hydraulic jump; Surges; Pipe networks. (b) Hydraulic Machines and Hydro power: Various pumps, Air vessels, Hydraulic turbines – types, classifications & performance parameters; Power house – classification and layout, storage, pondage, control of supply.

**2. Hydrology and Water Resources Engineering:** Hydrological cycle, Ground water hydrology, Well hydrology and related data analysis; Streams and their gauging; River morphology; Flood, drought and their management; Capacity of Reservoirs. Water Resources Engineering : Multipurpose uses of Water, River basins and their potential; Irrigation systems, water demand assessment; Resources - storages and their yields; Water logging, canal and drainage design, Gravity dams, falls, weirs, Energy dissipaters, barrage Distribution works, Cross drainage works and head-works and their design; Concepts in canal design, construction & maintenance; River training, measurement and analysis of rainfall.

**3. Environmental Engineering:** (a) Water Supply Engineering: Sources, Estimation, quality standards and testing of water and their treatment; Rural, Institutional and industrial water supply; Physical, chemical and biological characteristics and sources of water, Pollutants in water and its effects,



Estimation of water demand; Drinking water Standards, Water Treatment Plants, Water distribution networks. (b) Waste Water Engineering: Planning & design of domestic waste water, sewage collection and disposal; Plumbing Systems. Components and layout of sewerage system; Planning & design of Domestic Waste-water disposal system; Sludge management including treatment, disposal and re-use of treated effluents; Industrial waste waters and Effluent Treatment Plants including institutional and industrial sewage management.

**(c) Solid Waste Management:** Sources & classification of solid wastes along with planning & design of its management system; Disposal system, Beneficial aspects of wastes and Utilization by Civil Engineers. (d) Air, Noise pollution and Ecology: Concepts & general methodology.

**4. Geo-technical Engineering and Foundation Engineering :** (a) Geo-technical Engineering: Soil exploration - planning & methods, Properties of soil, classification, various tests and inter- relationships; Permeability & Seepage, Compressibility, consolidation and Shearing resistance, Earth pressure theories and stress distribution in soil; Properties and uses of geo-synthetics. (b) Foundation Engineering: Types of foundations & selection criteria, bearing capacity, settlement analysis, design and testing of shallow & deep foundations; Slope stability analysis, Earthen embankments, Dams and Earth retaining structures: types, analysis and design, Principles of ground modifications.

**5. Surveying and Geology:** (a) Surveying: Classification of surveys, various methodologies, instruments & analysis of measurement of distances, elevation and directions; Field astronomy, Global Positioning System; Map preparation; Photogrammetry; Remote sensing concepts; Survey Layout for culverts, canals, bridges, road/railway alignment and buildings, Setting out of Curves. (b) Geology: Basic knowledge of Engineering geology & its application in projects.

**6. Transportation Engineering:** Highways - Planning & construction methodology, Alignment and geometric design; Traffic Surveys and Controls; Principles of Flexible and Rigid pavements design. Tunneling - Alignment, methods of construction, disposal of muck, drainage, lighting and ventilation. Railways Systems – Terminology, Planning, designs and maintenance practices; track modernization. Harbours – Terminology, layouts and planning. Airports – Layout, planning & design.

## **ELIGIBILITY:-**

Sep 27, 2019 - Age Limit Criteria in IES states that lower age limit for UPSC IES exam is 21 years and Upper Age Limit is 30 years. The aspirant must not have been born earlier than January 02, 1988 and not later than January 01, 1997. Candidate applying for IES 2019 must meet the mentioned IES Age Eligibility by January 01, 2019

### **(I) Nationality:**

A candidate must be either:

- a. a citizen of India, or
- b. a subject of Nepal, or
- c. a subject of Bhutan, or

- d. a Tibetan refugee who came over to India before the 1st January, 1962 with the intention of permanently settling in India, or
- e. a person of Indian origin who has migrated from Pakistan, Burma, Sri Lanka or East African countries of Kenya, Uganda, the United Republic of Tanzania, Zambia, Malawi, Zaire and Ethiopia or from Vietnam with the intention of permanently setting in India.

Provided that a candidate belonging to categories (b), (c), (d) and (e) above shall be a person in whose favour a certificate of eligibility has been issued by the Government of India.

A candidate in whose case a certificate of eligibility is necessary, may be admitted to the examination but the offer of appointment may be given only after the necessary eligibility certificate has been issued to him/her by the Government of India.

### **(II) Age Limits:**

(a). A candidate for this examination must have attained the age of 21 years and must not have attained the age of 30 years on the 1st January, 2019 i.e., he/she must have been born not earlier than 2nd January, 1989 and not later than 1st January, 1998.

(b). The upper age-limit of 30 years will be relaxable up to 35 years in the case of Government servants of the following categories, if they are employed in a Department/ Office under the control of any of the authorities mentioned in column 1 below and apply for admission to the examination for all or any of the Service(s)/Post(s) mentioned in column 2, for which they are otherwise eligible.

- I. A candidate who holds substantively a permanent post in the particular Department/Office concerned. This relaxation will not be admissible to a probationer appointed against a permanent post in the Department/Office during the period of his probation. However, this relaxation will be admissible to a probationer so appointed provided he/she already retains a lien on a permanent post in a Department/Office under the control of any of the authorities mentioned in column 1 below.
- II. A candidate who has been continuously in a temporary service on a regular basis in the particular Department/Office for at least 3 years on the 1st January, 2019.

(c) The upper age-limit prescribed above will be further relaxable :

- I. Up to maximum of five years if a candidate belongs to a Scheduled Caste or a Scheduled Tribe.
- II. Up to maximum of three years in the case of candidates belonging to Other Backward Classes who are eligible to avail of reservation applicable to such candidates. The closing date fixed for the receipt of the application will be treated as the date for determining the OBC status (including that of creamy layer) of the candidates.
- III. Up to maximum of five years if a candidate had ordinarily been domiciled in the State of Jammu and Kashmir during the period from the 1st January, 1980 to the 31st day of December, 1989.
- IV. Up to maximum of three years, in the case of Defence Services personnel, disabled in operations during hostilities with any foreign country or in a disturbed area, and released as a consequence thereof.

- V. Up to maximum of five years in the case of Ex-servicemen including Commissioned Officers and ECOs/SSCOs, who have rendered at least five years Military Service as on 1st January, 2019 and have been released (i) on completion of assignment (including those whose assignment is due) to be completed within one year from 1st January, 2019 otherwise than by way of dismissal or discharge on account of misconduct or inefficiency, or (ii) on account of physical disability attributable to Military Service, or (iii) on invalidment.
- VI. Up to maximum of five years in the case of ECOs/SSCOs who have completed an initial period of assignment of five years of Military Service as on 1st January, 2019 and whose assignment has been extended beyond five years and in whose case the Ministry of Defence issues a certificate that they can apply for civil employment and they will be released on three months' notice on selection from the date of receipt of offer of appointment.
- VII. Up to a maximum of 10 years in the case of candidates of PwBD (viz. Locomotor Disability including Cerebral Palsy, Leprosy cured, Dwarfism, Acid Attack victims & Muscular Dystrophy and Hard of Hearing).

### **(III) Minimum Educational Qualification:**

For admission to the examination, a candidate must have –

- a. obtained a degree in Engineering from a University incorporated by an Act of the Central or State Legislature in India or other Educational Institutions established by an Act of Parliament or declared to be deemed as Universities under Section 3 of the University Grants Commission Act, 1956; or
- b. passed Sections A and B of the Institution Examinations of the Institution of Engineers (India); or
- c. obtained a degree/diploma in Engineering from such foreign University/College/Institution and under such conditions as may be recognised by the Government for the purpose from time to time, or
- d. passed Graduate Membership Examination of the Institution of Electronics and Telecommunication Engineers (India); or
- e. passed Associate Membership Examination Parts II and III/Sections A and B of the Aeronautical Society of India; or
- f. passed Graduate Membership Examination of the Institution of Electronics and Radio Engineers, London held after November, 1959

Provided that a candidate for the post of Indian Naval Armament Service (Electronics Engineering Posts) and Indian Radio Regulatory Service Group 'A' may possess any of the above qualifications or the qualification mentioned below namely:-

- a. For Indian Naval Armament Service (Electronics Engg. Posts) - M.Sc. degree or its equivalent with Wireless Communication Electronics, Radio Physics or Radio Engineering as a special subject.
- b. For Indian Radio Regulatory Service – M.Sc. degree or its equivalent with Wireless Communication Electronics, Radio Physics or Radio Engineering as a subject or Master's Degree in Science with Physics and Radio Communication or Electronics or Telecommunication as a special subject.

## **RECRUITMENT THROUGH ESE BRANCHWISE:**

### **1. CIVIL ENGINEERING:**

#### **Group-A Services/Posts**

- (i) Indian Railway Service of Engineers.
- (ii) Indian Railway Stores Service (Civil Engineering Posts).
- (iii) Central Engineering Service.
- (iv) Indian Ordnance Factories Service AWM/JTS (Civil Engineering Post)
- (v) Central Engineering Service (Roads), Gr 'A' (Civil Engineering Posts).
- (vi) Central Water Engineering Service Gr 'A' (Civil Engineering Posts)
- (vii) Survey of India Group 'A' Service.
- (viii) AEE(Civil Engg Posts)in Border Roads Engineering Service Gr 'A'.
- (ix) AEE(Civil) of P&T Building Works Gr 'A'.
- (x) Indian Defence Service of Engineers
- (xi) AEE(QS&C) in Military Engineer Service (MES)Surveyor Cadre.

### **2.MECHANICAL ENGINEERING**

#### **Group-A/B Services/Posts**

- (i) Indian Railway Service of Mechanical Engineers.
- (ii) Indian Railway Stores Service (Mechanical Engineering Posts).
- (iii) Indian Ordnance Factories Service AWM/JTS (Mechanical Engineering Posts).
- (iv) Central Electrical and Mechanical Engineering Service (Mechanical Engineering Posts).
- (v) Geological Survey of India Engineering Service Gr 'A'
- (vi) Central Engineering Service (Roads), Gr 'A' (Mechanical Engineering Posts).
- (vii) Central Water Engineering Service Gr 'A' (Mechanical Engineering Posts).



- (viii) AEE(Mech Engg Posts) in Border Roads Engineering Service Gr 'A'.
- (ix) Indian Naval Armament Service
- (x) Indian Defence Service of Engineers.
- (xi) Central Power Engineering Service Gr 'B' (Mechanical Engineering Posts).

### **3.ELECTRONICS AND COMMUNICATION ENGINEERING:**

- (i) Indian Railway Service
- (ii) Indian Railway Stores Service
- (iii) Central Electrical and Mechanical Engineering Service
- (iv) Indian Ordnance Factories Service AWM/JTS
- (v) Indian Inspection Service (Asstt. Dir. Grade I).
- (vi) Indian Supply Service Gr 'A'.
- (vii) AEE(Electrical) of P&T Building Works Gr 'A'.
- (viii) Indian Naval Armament Service.
- (ix) Indian Defence Service of Engineers
- (x) Central Power Engineering Service Gr 'B' .

### **REFERENCE BOOKS:**

#### **Books for Mechanical Engineering :**

1. Fundamentals of Classed Thermodynamics - Van Wylen
2. Heat Transfer - Gupta Prakash
3. Heat and Mass Transfer - R. Yadav
4. Energy Conversion - Sukhalmoy
5. Environmental Pollution Central Engineering C S Rao
6. Surveying and Levelling - T P Kanetkar

7. Heat Conversion - Arora & Kundwar
8. Manufacturing Science - R K Jain
9. Thermodynamics - R Yadav Theory of Mechanics - S S Rattan
10. Theory of Mechanism and Mechanics - Jagdish Lal.
11. Mechanic of Solids – Popru
12. Manufacturing Science - Ghosh and Malik
13. Manufacturing Technology - P N Rao
14. Production Manangement - R K Jain
15. Principles of Manufacturing Material & Process – Campbeu

#### Other References

1. Engineering Thermodynamics: PK Nag
2. IC Engine: ML Mathur and RP Sharma
3. Gas Turbine and Propulsive Systems: PR Khajuria & SP Dubey
4. Fluid Mechanics: Modi & Seth RK Bansal
5. Compressible Flow: SM Yahyn
6. Heat and Mass Transfer: JP Hollman and RC Sachdeva
7. Refrigeration and Air Conditioning: CP Arora and Domkundwar
8. Fluid Machinery: Jagdish Lal and RK Bansal
9. Theory of Machines: RS Khurmi; Malik & Ghosh
10. Mechanical Vibration: Grove
11. Machine Design: Shigley; VB Bhandari
12. Material Science: WD Callister; IP Singh
13. Production Engineering: Kalpakjian Schmid; Amitabh Ghosh & AK Malik - Buy from Amazon.in

14. Industrial Engineering: O P Khanna; Buffa & Sarin
15. Operations Research: Kanti Swarup
16. Strength of Materials: Gere & Timoshenko; BC unamia; Sadhu Singh - Buy from
7. Refrigeration and Air Conditioning: CP Arora and Domkundwar

**Books for Civil Engineering:**

1. Engineering Mechanics - Shames
2. Mechanics for Engineers- B Johnson
3. Engineering Mechanics - Mchean
4. Limit State Design - Ram Chandra
5. Surveying - Punmia
6. Strength of Material - V N Vazaram
7. Soil Mechanics and Foundation Engineering - A Singh and K R Arora
8. Strength and Meterials -UC. Jindal
9. Introduction to Mechanics of Solids - Crandall
10. Basic and applied Fluid Mechanics-Garde
11. Strength of material - Gere and Timoshenko
12. Concrete Technology - MS Shetty
13. RCC (WSM) - Shyal and Goyal
14. RCC (LSM) - AK Jain
15. Steel Structure - L S Negi
16. Soil Mechanics - K R Arora
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